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The Importance of New Suggestions.

THE parallel column used to be employed far more extensively than it is to-day in critical journalism. And very deadly it often was in its effect. Newspapers, writers, financiers, inventors and, of course, politicians, were found to be unstable in their views, inconsistent in their claims, and many were the interesting examples of kaleidoscopic changes in thought and idea in the self-same mind. We plead guilty to the use of the "deadly parallel" ourselves on many occasions in our earlier days, and if we have allowed the practice to fall into disuse, it is not from lack of opportunity so much as from the general change that has come over us all in years which have brought with them transition, new conditions, new ideas, and new views of things. We show charity to—even justify—the man who can have the courage to change his mind and say so.

In the electrical world many old things have passed away, though not all things have become new. Ideas and suggestions that to-day are welcomed enthusiastically and appear to be admirable for practical application may have been critically written about in these pages, discussed in small electrical circles, and pronounced ludicrous, or even worse, when they were first made. So when we find old ideas revived by modern men, let us not be too ready to condemn them because an earlier generation regarded them adversely.

One of the dangers of organisation when carried to extreme—we are not blind to the advantages of co-operative working within reason—is that too many men may come to think and act alike, just in order to present an appearance of "agreement," leaving less freedom or latitude for individual genius and enterprise. Even common uniting principles may not in their application have yielded the results that had been anticipated, thus inducing in some hearts a disposition to have recourse to a line of conduct which in other times and conditions was deemed disastrous.

Then in respect of new propositions for the more rapid development of the electrical industry—bringing electrical uses within the compass of those sections of the community possessing moderate means, introducing "stunts" for popularisation purposes, cheapening the cost of things—surely in these

directions we shall badly err if we fail to keep an open mind to admit any and all suggestions that may be made. We should not be too ready to dismiss, for example, such a suggestion as Mr. J. Christie advanced at Brighton, *i.e.*, that we wanted a few "Drages" in the electricity business, who would by some original conception find a new and popular way for arousing the interest and suiting the pocket of the home-makers of England. We are frequently impressed by correspondents with the need for cheapening installation costs as well as electricity charges, and the great difference between the first cost of some electrical products and the price at which they are sold to the public is emphasised. Then in smaller ideas, "stunts" of any kind that mean individual enterprise are to be commended. Those who, for reasons of self-interest keep to beaten paths, cannot see further than two inches from their "optics," and call suggestions that they do not like "perverted views," would do well to borrow a pair of field glasses. Free lamps were a feature at Bradford very many years ago, so-called free wiring was tried too in many places as a means of promoting the selling of "juice." Because they failed then, it does not follow inevitably that they would do so to-day, and must therefore be dismissed with scorn. Irons are being given away in one important area here to-day with gratifying results to the undertaking, and in America, as Mr. R. B. Mitchell pointed out at the I.M.E.A. meeting, such efforts are found to be well worth while. He mentioned that in Chicago in one year five and a quarter million lamps were given out on the free-replacement system; also that the relaying of distribution mains in residential areas was faced quite cheerfully because it was confidently expected that such increased returns would be experienced as would make the expenditure well worth while. Mr. Mitchell quoted these and other developments for the benefit of those amongst us who do not encourage the use of appliances for purposes other than lighting by domestic consumers.

We recall from the past a suggestion which was advanced for the wholesale purchase of electrical apparatus, &c., co-operatively by municipal electricity supply authorities so as to reduce the cost thereof to the public. We published views from all quarters on the proposition, and it advanced no further, but the suggestion had as one of its claims that it would have eliminated middle extractions of profit, and so would cheapen the cost of electrical service to the private consumer. Taking the long view, we believe that the electrical industry as a whole stands to gain most by securing, by almost any means, a rapid increase in the use of electricity for all purposes. The more appliances we install, the greater will be the consumption, the larger the consumption the lower the cost, the lower the cost of electricity, the more easy it will be to secure consumers; more plant, more cables, more wiring, more apparatus, more everything will be required until saturation point be reached. And that is a very long way to go! The section of the electrical industry that fails to see that it is worth an effort, or sacrifice, to win the public over to the side of electricity may serve its own immediate interests, but it is taking a short-sighted view and a purely sectional one, an attitude which we cannot commend.

It will be quite in keeping with the foregoing comments if we mention one or two other current ideas; perhaps their recital will produce still more in fertile brains. The need for a larger policy in respect of showrooms and the possible opening for a chain of electrical service and repair depôts throughout the country, perhaps at battery-service depôts, or perhaps at electricity works, has been already mentioned. Then there has long been a feeling in some minds that there was scope in such a big centre as London for one large centrally-located Electrical Store where every kind of electrical appliance and device for the home, and every different make thereof, could be displayed for public exhibition, a Store to which the public could go either with or without contractors' or architects' introductions. It could be a permanent exhibition run by a big private company or a co-operative amalgamated company of manufacturers or traders. In this connection one may mention again the scheme that has been set afoot for a Domestic Appliance Section of the London Chamber of Commerce. If this project matures satisfactorily it ought to be possible, by means of co-operation between the makers of all classes of labour-saving appliances for the household, for such a permanent collection of products to be brought together as will provide a common ground for most excellent educative work which will emerge into large business. Our only fear is that electrical appliances may have to sing small in company with what looks like the predominant partner in the scheme—gas! But it is a new idea, and as such it is worthy of attention from electrical firms which are looking to the domestic field either immediately or in the future.

Points in Registration.

THOUGH we have frequently written in favour of the registration of electrical contractors (shall we call them "Electractors"?), we agree with some of the speakers at Brighton in the opinion that there is a great deal of spade work to be done before it will reach anything like effective proportions. The movement is quite young, and many new questions arise in connection with it as experience accumulates. A point that is not free from difficulty is the means for dealing with the once-registered contractor who, because of something done or left undone, is not regarded as eligible to continue on the roll. Recognising that publicity is essential to the success of the movement, we have published the names of those admitted to membership, and periodically we announce each new batch of additions as received from the secretary. We further pass on the information that a number of applications were turned down, indicating the careful exercise of discretion by the committee, but as reasons for rejection cannot be published, a screen is drawn to hide a multitude of sins calculated to mar the reputation of electricity. But what is to happen when, because of some unacceptable practice or bad work, a registered member is asked to retire? It is important that the name should be known quite as widely, or even more so, than that of the reputable Registractor, but black lists are dangerous things, and neither associations nor journals can indulge in them without running some measure of risk. Reasons for removal cannot be broadcast any more than reasons for original rejection. One way out seems to be more frequent publication of the complete lists, so that interested parties may judge from comparison whether a certain contractor is still beyond reproach in the eyes of the Executive; but editors have not unlimited space at their command. The work of the selection and rejection committee must be very arduous owing to the absence of a definite code of rules and to the lack of inspection of work. Error or oversight on the part of contractors or their workmen—even registered contractors—is sometimes discovered by employés of the electricity department when making tests, and the consumer is placed under an obligation to the latter and loses respect for the contractor, but this does not happen always, for sometimes ordinary tests may not show points of weakness. If workmanship is inefficient and inspection is inadequate, the householder may learn that whereas gas is smelt electricity is felt, and he may prefer the former. Poor workmanship and defective material may be a curse to the industry whoever is responsible for them, but if a Registractor makes mistakes or fails to do the right thing from any other cause, there is a slur cast upon registration as well. While we are feeling our way in regard to such matters, it may not be waste of time to note the suggestion that joint authority should be set up by the insurance companies to ensure that all installations are up to a required standard. How many private residence installations are inspected on behalf of the Fire Offices? Yet a large amount of work is carried out by unregistered firms, additions are made from time to time

perhaps by others concerning whose efficiency or otherwise nothing is known, and tests may or may not be made. The appointment of a Wiring Inspector by the City of Hull and the attention given to the matter at Londonderry, where the city electrical engineer has expressed his willingness to have wiring work inspected during its installation, were mentioned in our "Business Notices" last week.

Who Secures Consumers?

THE author of the paper on co-operation between contractors and the supply authority, which was read at Brighton, will not be annoyed with us if we describe him as a humorist. Of being a lawyer he is not ashamed and of coming from north of the border he is proud, and while allowing that he may sometimes enjoy Baalam's company he rejoices in the fact that he does not fall to any lower grade than such company in respect of intelligence. On the contrary, we feel that he rides a very high horse and makes the contractor do so too when he, in the words of his paper, says:—

"*The thousands of consumers who took up . . . supply in the early days and, I may say, the millions of consumers who are on the mains to-day, have all been obtained by the initiative and canvassing of private electrical contractors.*"

We absolve the contractor from responsibility for the statement, for the author was careful to intimate that he, and he alone, was responsible for the views he expressed. Indeed, what contractor would have said such a thing as this? Who but a lawyer could have made such a claim? Electricity supply officials in most parts of the country can afford to smile. All the excellent work that they have done in canvassing, educational, showroom, advertising, lecturing, and other business-getting and development work, and generally securing new consumers and satisfying them, during the past decade or two is well known, and no extravagant statement can rob them of the credit that is their due, even though it be made in a paper devoted to a discussion of means for securing greater co-operation and goodwill between contractors and supply men. All we need say is that if Mr. W. Finlay's statement quoted above had been true, the electrical industry would have been saved from at least one of its lengthy controversies, and his own paper need never have been written.

Electrical Industry in France.

THE latest information to hand regarding the French electrical industry is contained in the report of the directors of the Compagnie Française Thomson-Houston. Owing to the company's organisation its share of export trade made considerable progress during the year 1925, and further increase is expected. The orders are rather unequally distributed over the different works, but it is found that though hopes of an ideal distribution are unlikely to be attained, a much nearer approach thereto is being made. At the annual meeting of the company, M. Laurent, the chairman, alluded to the encouraging outlook for the export trade, and mentioned as favourable factors the low costs of production in comparison with foreign prices, the intensified search for months past for new markets and a maintenance of quality of product. These factors had not only produced larger orders, but had also contributed materially to the defence of the franc. With reference to the home market, M. Laurent directed attention to a report presented a few weeks ago to the commission on public equipment of the Association d'Expansion Economique. It is stated in that report that during the next ten years it will be necessary to place orders for, and equip, steam power stations for 500,000 kW and hydro-electric works for 1,000,000 kW. The commission considers as a matter of prime urgency the continued electrification of the railways, and the establishment of high-voltage lines; and the electrification of country districts is proceeding on such a scale and with a rapidity which were unexpected. No doubt the financial situation, the treasury difficulties, and the depreciation of the franc, which weigh so heavily on the country, represent a temporary obstacle to the rapid execution of the programmes already prepared or in course of preparation, but the great advantages which these schemes possess, especially from the diminution in the purchase of foreign coal, the creation of new industries, and the facilities given to agriculture and the railways, are such that electrification schemes will undoubtedly take precedence of all other public works.

Swiss Electrical Industry.

SOME notes on the position of the electrical manufacturing trade in Switzerland are found in the report of the directors of Brown, Boveri & Co., of Baden. It is stated that the conditions of the company's business and its foreign sales, as well as the uncertain currency conditions in important countries, have rendered it necessary to make cautious calculations. It appears that, generally speaking, the situation of the Swiss machinery industry was too favourably estimated. Although, very largely in consequence of the orders for the electrification of the Swiss railways, a great increase in activity took place in 1925, as compared with the previous crisis, the export conditions affecting Swiss industry are still very difficult. It is remarked that through inconsiderate and unjustified pressure of prices in countries with an unstable currency the export situation has become worse; the exports to countries with a depreciated currency have naturally declined. In order to find compensation for lost markets, or markets where sales have fallen, business in the United States has been extended; the American Brown Boveri Electric Corporation was established in October, 1925. A part of the extensive workshops of a shipbuilding corporation in Camden is in course of adaptation to produce new manufactures; and the apparatus works of the Conduit Electrical Manufacturing Corporation of Boston, and of the transformer works of the Moloney Electric Company of St. Louis, which were embodied in the new American company, are fully occupied and are working well. The directors say that they hope to secure a share of the large demand in the American market. The accounts show net profits of 4,180,000 fr., as compared with 3,450,000 fr. in the previous year, with an advance in the rate of dividend from 6 per cent. in 1924 to 7 per cent. for 1925.

Sir Hugo Hirst's Speech.

IN the course of the statement by Sir Hugo Hirst, read at the annual meeting of the General Electric Co., Ltd., this week by Mr. Ernest G. Byng, vice-chairman, and son of the late Mr. Gustave Byng, in the absence of Sir Hugo under doctor's orders, comments were made on the industrial situation and the Electricity (Supply) Bill. He urged that greater attention should be paid to the scientific production and treatment of coal if the mining industry was to regain the ground lost to oil and water power, and maintained that the problem involved in the present dispute was not merely one of wages and hours. He looked forward to the extension of the Trade Facilities Act to aid in the reorganisation of the coal industry.

With regard to the Electricity (Supply) Bill, Sir Hugo reaffirmed his faith in the measure as likely to bring greater prosperity to the electrical industry. He sympathised with those whose interests might be adversely affected, but thought that their opposition would lead to a better Bill. While realising that much consideration was essential, he hoped that the passing of the measure into law would not be too long delayed.

Another point mentioned was the fact that the sales of the company rose and fell in direct proportion with the fluctuations in the general activity of the country, and did not depend so much upon what they could do electrically. Sir Hugo deduced from this that if the general welfare of the community was assured, the company could not fail to prosper, but we believe he would be one of the last to discount the value of electrical productive enterprise or of electrical development propaganda.

The Mont Blanc Cable Railway.

An Electrically-Operated System in France.

AMONG the notable engineering enterprises at present in progress in France is an electrically-operated cable railway up Mont Blanc, work on which was started in 1909, but was suspended during the war and only recommenced in 1922. The line starts at the village of Pelerins, near Chamonix, at an altitude of 3,473 ft. above the sea, and is to be continued up the Col du Midi, 11,670 ft. above sea level, and possibly later to the Aiguille du Midi, 12,605 ft. The system adopted is that of suspended cars devised by Messrs. Strub & Feldmann, and already in use on the Wetterhorn, in Switzerland, and the Meran, in the Tyrol; the work is being carried out by a Bordeaux firm under the supervision of M. L. Vallot, director of the Mont Blanc Observatory.

Between Pelerins and the Col du Midi there will be four intermediary stations, at Cascade du Dard (3,968 ft.), La Para (4,871 ft.), La Pierre Pointue

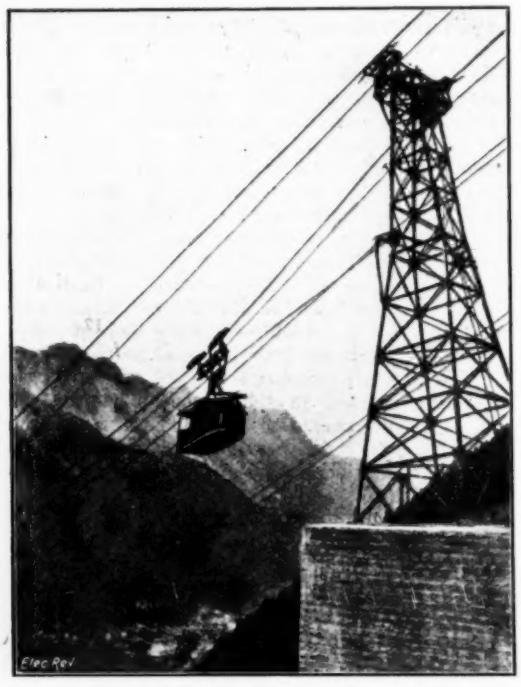


Fig. 1.—Part of the Completed Portion of the Mont Blanc Railway.

(6,678 ft.), and Les Glaciers (8,737 ft.), the gradient of the line ranging between 17 and 72 per cent. The section between Pelerins and Les Glaciers has been in operation for some time, figs. 1 and 2, and work is well in hand on the remaining portion.

Four cables are used in connection with the line, fig. 3: (1) The carrying cable, which is fixed and forms a track for the car-carrying trolley; it is of open construction and comprises 259 crucible-steel twisted wires, 3 mm. in diameter. The cable has been submitted to a tension test of 30 tons, and has a factor of safety of over 10; at its lower end it passes round a drum, the necessary tension being obtained by a 20-25-ton cement counterweight.

(2) The traction cable, by means of which the cars are moved along the ropeway. It has an outside diameter of 32 mm. and a breaking strain of 60 tons. The cable is endless, and at the upper terminus of the line passes round a three-groove pulley and at the lower end round a single tension pulley.

(3) The brake cable, temporarily movable, which is not called upon to render any service in normal working, is similar to the traction cable. The arrangement

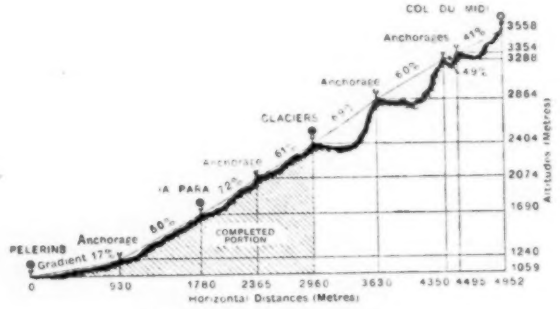


Fig. 2.—Profile of the Cable-way.

is such that, should the traction cable break, an automatic device will hold the car on the brake cable, which then becomes a traction cable by means of a clutch device on the pulley at the upper station.

(4) Finally, there is a fixed guide cable carried on pulleys on the supporting standards and passing through guides on the lower sides of the cars. The purpose of the guide cable is merely that of steadying the cars against the wind.

The fixed cables are supported at intervals on steel lattice towers, which maintain a distance of 13.1 ft. between the ascending and descending cars, and vary in height from 39 ft. to 108 ft., excluding the foundations; certain towers have been protected against damage by avalanches.

The cars utilised for passenger transport embrace three main sections: the supporting trolley, which comprises eight grooved wheels coupled two by two to a balance piece; the suspension and automatic braking device; and the car itself with side entrance doors and front and rear platforms for luggage. Accommodation is provided for twelve seated and six standing passengers, and the cars weigh 4½ tons fully loaded. The travelling speed is 492 ft. per minute, equal to 5.6 miles per hour.

The automatic braking device is shown in one of the accompanying sketches, for which we are indebted to

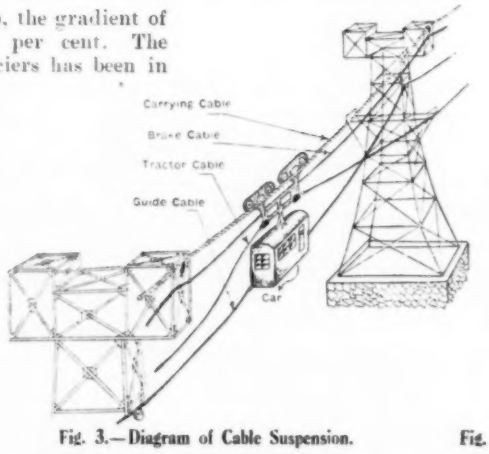


Fig. 3.—Diagram of Cable Suspension.

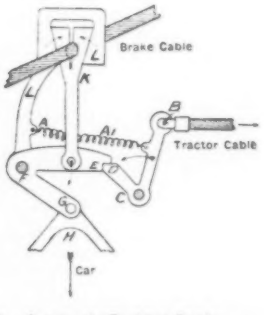


Fig. 4.—Automatic Braking Device.

Arts et Métiers. The carrying cable, fig. 4, is connected with the trolley by the intermediary of the cranked lever BCD, pivoted at C; this lever is maintained in position by the spring AA'. Should the trac-

tion cable break, the spring would pull over the lever, so releasing the lever EFG and causing the weight of the car to fall on the bar K. The head of the latter is split and held in a conical cage L, through which the brake cable is free to pass in normal working. If the traction cable were to break, the transfer of the weight of the car to the bar K would cause the split upper end of the latter to grip the brake cable almost immediately, numerous tests having shown that the car can be brought to rest within a distance of 1 metre (3.28 ft.). Provision is also made, should anything go wrong with the cars while travelling, for the braking gear to be operated by the conductor and the cars brought to a standstill.

A small electric station for the operation of the line is provided at the upper station of each section, in each of which is installed a 100-h.p. motor with double reduction gear. On one of the control shafts are mounted two brake drums, one being controlled by hand and the other adapted to be automatically brought into operation in case of excessive speed, interruption of the power supply, or should a car travel beyond a stopping point. As a protection against breakdown, a reserve electric motor is installed at each station, as well as a petrol engine and a hand-operated winding drum.

Tests made on the section of the line so far completed show that with a loaded ascending car and an empty descending car, the electricity absorbed is 40 kVA. With both ascending and descending cars loaded, the power required is only 4 kVA, while with an empty car going up and a loaded one coming down, no power consumption is necessary.

Minor Aerial Power Lines.

Some Notes on their Design and Construction.

By R. GRIERSON.

MANY articles have been published on the design of heavy aerial transmission lines for 3-phase, high-voltage systems, and much has been written on cheapening rural supplies by means of overhead pole lines, but when the present writer was called upon to erect short low-pressure lines he had some little difficulty in finding the necessary data on which to base the design and practical instructions for the men.

After considerable effort the information was collected, and is included in this article; it may prove of use to other engineers who find themselves unexpectedly faced with a similar problem. If sufficient interest is aroused in the subject, it is possible that valuable suggestions may be made which will lead to the cheapening of aerial-line construction.

1.—Electrical Characteristics.

The supply system was 240 V, direct current, two wire; the current to be carried was 10 amperes and the load at the receiving end consisted of a village hall and church lighting. A telephone line also had to be included.

The voltage drop on the line was figured at 4 per cent. in the first instance as being the maximum figure allowed by the Electricity Commissioners for the variation from the declared pressure at the consumer's terminals.*

This allows a pressure drop of 9.6 volts at full load, so that the maximum load at the receiving end should not exceed $10 \times 230 = 2,300$ watts.

2.—Copper Details.

The approximate length of the line is 1,000 yards and the total length of copper 2,000 yards, the maximum resistance of which should not exceed 10 volts/10 amps. = 1 ohm, or, say, 0.5 ohm per 1,000 yards, neglecting the resistance of the joints.

B.E.S.A. Standard Specification No. 125/1924, "Hard-drawn Copper Solid and Stranded Circular Conductors for Overhead Power Transmission Purposes," contains a useful table, from which the following data was extracted:—

Standard nominal area = 0.05 sq. in.
Diameter, 0.252 sq. in.
Weight, 1,000 yd., 576 lb.
Weight, 1 mile, 1,015 lb.
Resistance, 1,000 yd., 0.4937 ohm, at 60 deg. F.
Ultimate tensile strength, 2,875 lb.

For the telephone lines, reference was made to "The Construction of Aerial Lines on Roads and Railways."† Section IV B states that subscribers' circuits should be of 40-lb. (18 s.w.g.) bronze. Minor junction lines should be of 100-lb. (No. 14 s.w.g.) copper, and junction lines and railway crossings should be of 150-lb. (12½ s.w.g.) copper. "Regulations for Overhead Lines" (H.M. Stationery Office, 1d. net) states that the minimum size of copper for power lines should be 200 lb. (11½ s.w.g.), and therefore 150 lb./mile copper was selected as a convenient compromise, which should be substantial and give good results.

B.E.S.A. Standard Specifications No. 174 to 184, 1923, "Overhead Line Wire Material for Telegraph and Telephone Purposes," contains a useful table, from which the following data was extracted:—

Weight/mile, 150 lb.
Diameter, 0.096 in.
Minimum breaking load, 490 lb.
Maximum resistance, 5.899 ohms/mile.

3.—Pole Spacing.

The spacing of the poles next called for consideration, and the question of the dip or sag of the line wires between the supports was regarded as the governing factor, since this in turn governs the height of the poles to be used.

"Regulations for Overhead Lines," previously referred to, states in par. 12 that the minimum height should be 20 ft. clear of the ground at *any* point of the span at all temperatures below 122 deg. F.

The same Regulations further state, in par. 11: "The factor of safety shall be calculated on the assumption that the line conductors are at a temperature of 22 deg. F., and have a covering of ice to a radial thickness of one quarter of an inch, and that they are simultaneously subjected to a wind of 50 miles per hour at right angles to the line, this wind to be taken as exerting a pressure equivalent to 8 lb. per square foot calculated on the whole of the projected area of the ice-covered lines. The weight of ice is to be taken as 57 lb. per cubic foot."

This seemed to be an altogether too lengthy problem to be solved during a normal earthly career, but just then a copy of the "Pole Line Materials" list, issued by British Insulated & Helsby Cables, Ltd., materialised in the office, and this was found to contain some extremely useful tables.

For 0.05 sq. in. conductor, erected on the basis of a factor of safety of 2, a ½-inch radial coating of ice, and a wind pressure of 13½ lb./sq. foot, or 0.6 times the diameter, and a temperature of 22 deg. F., the following figures were extracted from the table on page 29:—

Span (ft.)	100	120	150	180	210	240	300
Sag or dip (in.)	12·4	17¾	27¾	40	54·5	71	1·1
Stress (lb)	1389	1389	1389	1389	1389	1389	1389

Vide Electricity Commissioners' Regulations, under the Electric Lighting Acts, 1882 and 1888, Sect. 13, par. 3.

†Post Office Engineering Department, Technical Instructions XIII; published by H.M. Stationery Office, 1s. 6d. net.

100-foot spacing appeared to be rather extravagant and costly in poles, and 300-foot spacing called for unduly long poles to allow for the 111 inch or 9 ft. 3 in. sag. The medium spacing of 150 ft. or 50 yd. was therefore decided upon as a convenient compromise.

Hard-drawn copper wire is very elastic within certain well-defined limits. The tension of the wire in all circumstances is proportional inversely to the sag and directly to the load, and the sag varies with the material, but not with the gauge.

With the heavier lines, small dips call for very heavy pulls, *e.g.*, 5,000 to 11,000 lb. There is, of course, no special merit in pulling conductors up and designing lines to withstand these heavy stresses. Consideration should therefore be given to the possibility of increasing the dip, increasing the height of the poles, and the separation of the lines, to avoid risk of contact when the lines sway in the wind.

4.—Arrangement of Lines on Poles.

The line passes over ground that is frequently shot over by the owner, and instructions were given that the line should be terminated and definitely made off at frequent intervals in order to limit the damage in the event of a line being accidentally shot down.

Since the maximum pull on each of the heavy lines (as shown above) is 1,389 lb., cross arms were considered undesirable, since the leverage would probably either twist the cross arm off or turn the pole round in the ground, should a line be shot down. It was, therefore, decided to fix the insulators directly to and on alternate sides of the poles, vertically above each other, the telephone lines being arranged as the lower pair, fig. 1, since the rule relating to minimum clearance from the ground applies to the power lines only.

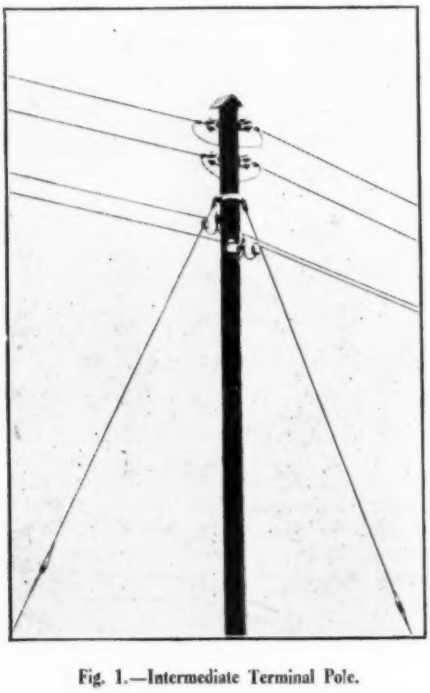


Fig. 1.—Intermediate Terminal Pole.

Starting from the top of the pole, therefore, nine inches down is the live wire, twenty-one inches down the earthed negative power line, thirty-seven inches down one of the 'phone lines, and forty-six inches down the other 'phone line.

5.—Height of Poles.

Poles of ordinary size are planted in the ground to a depth of from four to six feet, according to length and description, character of soil, &c. A depth of 5 ft. was decided upon, as the line runs over a fairly exposed track of country.

The vertical dimensions of the poles, fig. 2, were fixed as follows:—

In ground	5′ 0″
Minimum clearance	20′ 0″
Dip or sag	2′ 3¾″
Clearance between upper and lower lines	1′ 0″
Upper line to pole tip	0′ 9″
	29′ 0¾″

The nearest standard length to this figure is 30 ft., and this was accepted.

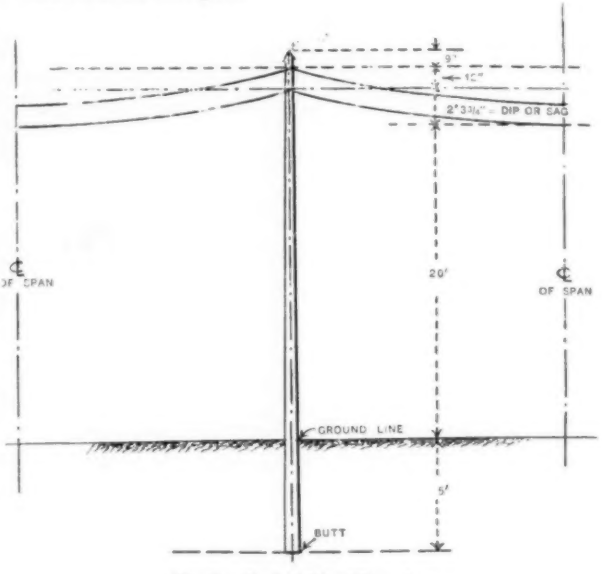


Fig. 2.—Vertical Line Dimensions.

For 30-ft. poles, B.E.S.A. Standard Specification No. 139, 1921, shows the following:—

Type.	Tips.	5 ft. from butt.	Approx. weight.
Light	5 to 6 in.	7¼ in.	3½ cwt.
Medium	6 to 7¼ in.	8¾ in.	4½ cwt.
Heavy	7¼ to 9½ in.	10¾ in.	7 cwt.

6.—Strength of Single Poles.

The factor of safety of 3.5 for wooden poles has to be calculated on the basis for lines already given, according to paragraph 7 of the "Regulations for Overhead Lines" referred to above. This appears to be a complicated proposition, but the "Helsby" list includes a table which simplifies the whole problem.

All that it is necessary to do is to obtain the resultant figure R by multiplying the diameter of each conductor in inches, under the worst conditions, by its distance from the ground in feet, adding these results together and multiplying by the length of span in feet. Against the resultant R in the table, the diameter of the pole at a height of 5 ft. from the butt can be directly obtained for any length of pole.

In the present case the lines were spaced directly over each other, and the calculation is as follows:—

Ground to conductor.	Diameter of conductor.	
24′ 3″	× (1″ + 0·25)	= 30·3
24′ 3″	× (1″ + 0·25)	= 29·1
21′ 11″	× (1″ + 0·096)	= 24·0
21′ 2″	× (1″ + 0·096)	= 23·1
Total		= 106·5 × 150 = 15,975 = R.

Reference to the table shows that for a single pole 26 ft. out of the ground, when R equals 16,000, the pole butt should be 8½ inches diameter. Reference to the table given in the previous paragraph shows that a medium pole will be required, *viz.*, 6 to 7¼ in. tip, 8¾ in. butt, and weighing approximately 4½ cwt.

For the benefit of those readers who prefer to calculate problems from first principles, rather than rely on tables and formulæ, it may be said that the problem resolves itself into one of a beam, fixed at one end and subjected to two loads, *e.g.*, one due to wind pressure on the pole itself, distributed equally over the exposed surface of the pole, and the other due to the wind acting

on two half spans of the line, which can be regarded as concentrated at the insulators.

7.—"H" and "A" Poles.

In cases where several medium or heavy lines have to be carried on straight runs, or for use at bends, or as terminal poles, it may be found that single poles, either with or without stays, will not meet requirements.

Under these circumstances two poles may be bolted together to form either an "A" or an "H" pole, or three or four poles may be used to form a tower.

The "A" pole is said, by competent authorities, to be about $4\frac{1}{2}$ times as strong as a single pole of similar dimensions in a direction at right angles to the line, and is clearly twice as strong in the direction of the line. For maximum strength the spread at the butts of an "A" pole, fig. 3, is usually made one-eighth of the length of the poles.

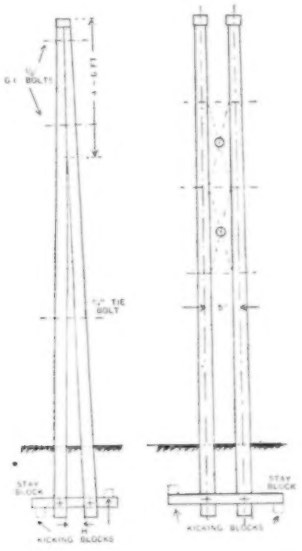


Fig. 3. Fig. 4.

Details of "A" and "H" Poles.

Before the decision to use this type of pole is taken, very careful consideration should be given to possible alternatives, since they are expensive in material, carriage and cartage, and costly to put together on site and erect.

Naturally, the two poles should be of similar dimensions and appearance. Each pole is scarfed at the upper end to a depth of about one-third of its diameter and a length of from four to six feet from the top. Fixing at the top end is by means of two $\frac{5}{8}$-in. bolts. A $\frac{3}{4}$-in. tie bolt between the two poles is required about half way between the top and the ground, and a 6-ft. stay block is bolted across the butts, notched to a depth of 6 in., and fixed with $\frac{3}{4}$-in. bolts. At bends in the line, when it is difficult to fix a stay wire, a kicking block may be fixed crosswise on one of the stay blocks, and secured to the butts of the poles, in a manner such that it counteracts the tendency of the block to rise. Another point to be observed is the necessity to plant the "A" pole slightly out of the vertical, *i.e.*, against the pull, so that when the lines are strained up and the poles settle down, they will not lean over in the direction of the pull. Either a large special or two standard pole roofs will be necessary, but only one earth wire need be fixed.

Care should be exercised, in erection, to see that both poles are resting on solid ground, and, in filling in the holes, to see that the earth is well rammed in.

If the space between the poles or the head room below the tie bolt is restricted, guards should be provided to prevent accidents to cattle, horsemen, &c.

"H" poles, fig. 4, are much more popular than "A" poles with electrical men, since they have the advantage that a greater number of wires may be more easily spaced and fixed either directly to the poles or by the use of cross arms, and also, at cross-roads, earthed cradles can be easily arranged. The distance apart at which the poles are planted depends on the number of lines to be carried, and the arrangement of the lines on the poles, but 5-ft. centres are quite common.

Stay blocks are fixed to the butts as for "A" poles, being notched in to a depth of about 6 in. Kicking blocks may be used at both ends of the stay block at bends in the line.

Since triangulation is the essence of rigidity of framed structures, to ensure lateral stability of the rectangle, formed by the two poles, the cross arm at the tips and the brace or stay blocks at the butt, a single or double trussing tackle should be fitted.

The G.P.O. fixes the lowest tie bolt of the trussing tackle 18 in. above the ground line, but as the tackle forms a set of very convenient climbing irons, giving access to the power lines, care should be exercised by electrical men in spacing them out. A useful arrangement is to fix the top bar about 5 ft. below the tips of the poles, particularly on terminal poles, as it then forms a useful platform from which insulators, choke coils, &c., may be examined. The warning mentioned in connection with the guarding of "A" poles should be considered when trussing tackle is used.

8.—Preservation of Wood Poles, Cross Arms, and Stay Blocks.

To prevent rotting, wood poles, cross arms, and stay blocks are preserved by seasoning and by the injection of antiseptics to neutralise the fermentative action of the sap.

Various methods have been suggested and employed, amongst which may be mentioned the use of a solution of chloride of zinc, and also copper sulphate. The process most generally favoured in the British Isles is the injection of oil of creosote, which is, of course, a distillate of coal tar. Full details are contained in B.E.S.A. Specification No. 139—1921.

(To be continued.)

A Large Oil-Electric Locomotive.

A 100-ton Shunting Engine Recently Introduced in America.

A 100-TON oil-electric shunting locomotive which has recently made its appearance in the United States is illustrated in fig. 1. It has a steel box-type cab with a platform carried on two four-wheel swivel trucks. The cab is divided into three compartments, the central one containing the power plant and control apparatus, while the two end compartments are reserved for the operator.

The equipment consists of oil engines of six-cylinder, vertical, four-cycle design, with pistons 10 in. in diameter and 12 in. stroke; each develops 300 h.p. at 600 r.p.m., and with suitable oil the fuel consumption does not exceed 0.43 pound per engine b.h.p. at the rated load and speed, based on oil of 19,000 B.th.u. per pound.

Each engine is equipped with a self-contained lubricating-oil system, with a directly-attached circulating pump. A water-circulating pump is connected direct to each engine for cooling the cylinders and heads, and an air compressor is connected direct to each engine to automatically keep the starting air bottles charged.

To each oil engine is directly connected a six-pole, 600-r.p.m., direct-current, compound-wound, commutating-pole generator; a 4-pole 60-volt generator is mounted on the same shaft as each main generator, and serves to excite the field windings of the latter, while a 32-volt storage battery is supplied for the exciter fields at low speeds. The main generators are differently compounded so that the voltage is approximately inversely proportional to the tractive effort.

There are four direct-current series motors of the single-geared, box frame, GE-69-C railway type, each supported on its axle by brackets and bearings and by the motor nose on the truck transom; the gearing was selected to give a maximum allowable locomotive speed of 30 m.p.h.

One of the distinctive features of this type of locomotive is its control system, which is made automatic by

the differential winding of the generator, so that the output current and voltage automatically adjust themselves to meet the requirements of the service and the power delivered by the engine. The only operating handle is the throttle lever that controls the output of the engine. An electric switch handle determines the connection of the motors in series or in parallel and for forward and reverse movements; no rheostats are used, so that the loss of power in the electrical circuits is reduced.

Means are provided for starting and stopping the engine from both operating positions, and non-inductive motor-field shunts give higher running speeds at light loads.

The auxiliary equipment includes a gasoline engine-driven air compressor; three high-pressure air-storage tanks used for starting the oil engines; a water heater and expansion chamber to keep the cooling water from freezing when the engines are not operating, and for heating the operator's compartments; four fin-type radiators of 2,400 sq. ft. total surface on the roof for cooling the water from the engine, &c.

Tests with this type of locomotive show its numerous advantages: In "switching" service during 68 days,

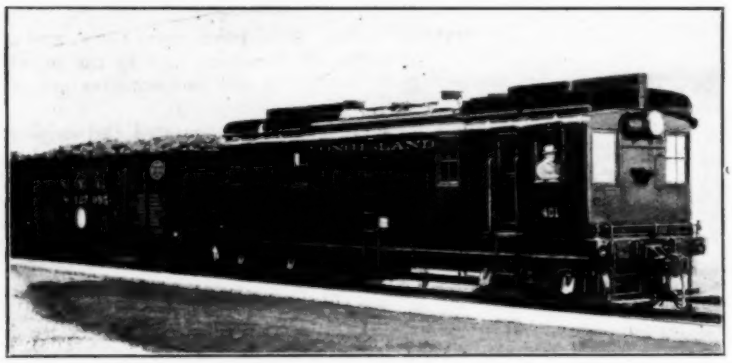


Fig. 1.—An American Oil-Electric Shunting Locomotive.

part of the time in 24-hour service, the engine has a record of 833 hours of actual duty. The cost of operation per hour of service amounted to 8.297 American sterling, and after two years in service there was no appreciable wear, nor were replacements needed. It is smokeless, and its fuel tanks will carry sufficient fuel for long continued service, the loss of time required for taking on fuel and water during service being thereby eliminated. As compared with an all-electric locomotive, no contact line is necessary, such as a third rail or trolley; at the same time it is easy to control and exerts a high tractive effort at low speed. The following figures give the leading dimensions of the locomotive:—

Length inside knuckles	45 ft. 10 in.
Height over radiator	13 ft. 9½ in.
Width overall	10 ft. 0 in.
Total wheelbase	36 ft. 2 in.
Track gauge	4 ft. 8½ in.
Minimum radius of curve (alone)	90 ft.
Total weight (all on drivers) ...	200,000 lb.
Weight per driving axle	50,000 lb.

The locomotive was built for service on the Long Island railroad, and the accompanying illustration shows it hauling a trailing load of 1,200 tons on the test track at the Erie works.

B.E.S.A. Publications.—The British Engineering Standards Association has recently issued specifications for brass bars, high-speed screwing and turning, and high-tensile brass bars and sections (Nos. 249-1926 and 250-1926, respectively). Tables giving the margins of manufacture for round, square and hexagon bars, whether extruded, rolled or drawn (after extrusion or rolling), are included as appendices to both specifications. Specifications covering naval brass bars and sections are in preparation. Copies of these new publications can be obtained from the B.E.S.A., Publications Department, 28, Victoria Street, London, S.W.1, price 1s. 2d. each, post free.

A Further Note on Demonstrating Loud Speakers.

By PAUL D. TYERS.

It might appear that there is nothing easier in wireless salesmanship than demonstrating a loud speaker. It would seem that one simply has to connect the loud speaker to the set, and allow the purchaser to form his own opinion. Actually, far more trouble should be taken than just that of merely connecting the loud speaker and switching on the set. However good a loud speaker may be, it cannot give pleasing results unless it is connected to a good set, which, further, must be properly adjusted, particularly with regard to the valves used, and the amount of high-voltage. Again, should a client wish to hear a small loud speaker, such, for example, as an Amplion "Dragonfly" or a Sterling "Dinkie," it is no use demonstrating these on an exceedingly powerful set provided with two or three stages of low-frequency amplification, as the output will be far too large, and will overload the loud speaker so that distortion will inevitably occur. This will be occasioned particularly by over-energisation of the diaphragm, and also probably by possible saturation, due to the steady anode current from the last valve. A loud speaker of this type is intended to work with a moderate input, and no attempt to use the speaker with very powerful output should be made, as it cannot do justice either to itself, to the set, or to the capabilities of the salesman.

The converse of this is, in some measure, also true. A large loud speaker used with a small set employing no power stages will, most certainly, give good reproduction, provided that the set is well designed, but it can never be shown to its full advantage, so far as intensity of sound is concerned, if the set is not capable of delivering sufficient undistorted volume for this purpose, and, of course, on no account should the set be "pushed to its limits" by introducing a large amount of reaction.

There is no doubt that the majority of well known loud speakers on the market to-day are really quite excellent productions, a correctly designed diaphragm type in the writer's opinion giving the best results. This may be shown both experimentally and also mathematically. It has been pointed out that a loud speaker cannot give good reproduction unless the set with which it is used is functioning correctly. Again, the majority of broadcast receivers are well enough designed to work efficiently provided that suitable valves and high and low voltages are used. The last stage of the amplifier should preferably employ a valve having an appreciable emission, such as a DE 5, an anode voltage of something of the order of 120 volts being used, together with a suitable negative bias on the grid. The exact voltages can be obtained by reference to the makers' data or curves. If this is not done, the last valve is almost sure to be incapable of dealing with the voltages applied to it from the preceding stage, with the result that blasting will occur.

Another very important point to remember when demonstrating is that on no account should the receiver be pushed to its limits, as previously mentioned.

Church Telephones.—A telephone system has just been installed in a Congregational church at Ramsgate, in order that members of the congregation who are deaf may hear and take part in the services. Microphones are placed out of sight on the pulpit, reading desk, or lectern. Each deaf worshipper is provided with a single telephone earpiece mounted on a handle. By the movement of a switch on the earpiece reception can be altered to suit varying degrees of deafness.

Radio-Telegraphy in Brazil.

Marconi Plant for the New Rio de Janeiro Station.

As has already been briefly announced, a new high-power radio-telegraph station was recently opened at Rio de Janeiro by the Brazilian Minister of Communications. The function of the new plant will be to provide means of communication between Brazil and other South American countries, as well as with the North American Continent, Australia, South Africa, and the European countries.

Fig. 1.—The Rio de Janeiro Radio-Telegraph Station.

The equipment consists of a 20,000-metre-ampere thermionic-valve transmitting outfit which, together with the aerial and earth screen and the latter's short masts, was supplied by Marconi's Wireless Telegraph Co., Ltd.

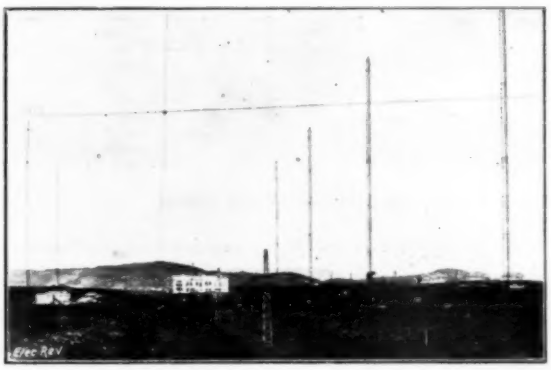


Fig. 2.—General View of 800-ft. Masts.

The first of the accompanying illustrations is an exterior view of the building in which is housed the transmitting apparatus. Prominent in the foreground and on each side of the picture are the leading-in bridges which support the aerial and earth-screen wires. Fig. 2 is a general view of the site, showing the 800-ft. high steel masts that cary the aerial, while the short masts visible in the centre foreground support the earth screen.

Lastly, fig. 3 shows some of the transmitting valves, in front of which is the engineer's controlling desk on which are mounted the necessary indicating instruments.

It will be recalled that less than a year ago a new naval radio-telegraph station was inaugurated on the Ilha do Governador, in the Bay of Rio de Janeiro. The Telefunken apparatus with which the station is equipped is of high-power, giving it a long range, and enabling communication to be established with North America and the Continent of Europe.

A month or two earlier another station, also equipped with German plant, was commissioned at Salinas, about 70 miles east of Para, under the supervision of the Brazilian Telegraph Department, whilst last summer the American, English, French, and German consortium was reported to have secured the approval of the authorities concerned for the construction of a large radio-telegraph station at Pernambuco for long-range work.

Other telegraph facilities have been augmented, so that during the past 12 months considerable effort has been directed to the improvement of means of communication with other parts of the world.

Radio - telegraphic stations in Brazil are exclusively under the control of the Government, their administration being regulated by the Minister of Public Works in the case of installations of a civil character, and by the Ministers of State for War and the Navy in the case of stations destined for national defence and the services of the military and naval forces. There are something like 215 stations in the country, which figure includes over 140 merchant ship stations, the next largest category being naval stations, of which there are about 36 in operation.

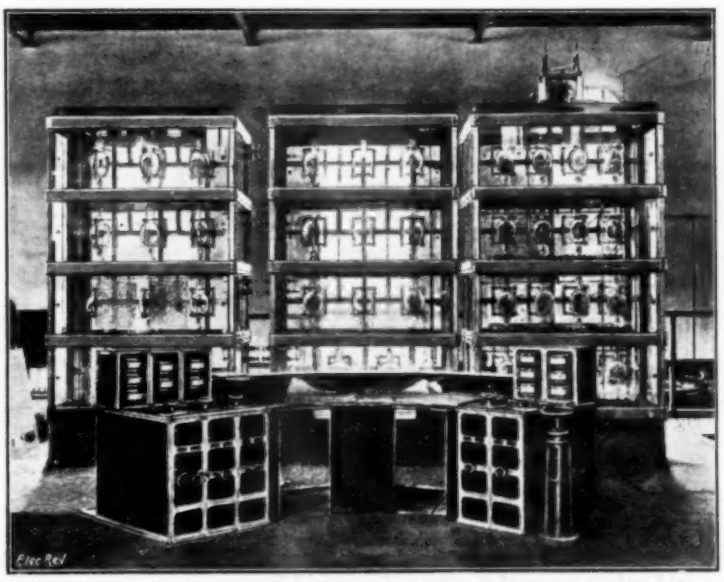


Fig. 3.—Marconi Transmitter and Control Desk.

The Harbour Power Station, Belfast.

Completion of New Generating Plant Control Room.

THE events which led up to the building of a new electricity generating station by the City and County Borough of Belfast, Northern Ireland, were chronicled in our pages some years ago. It will be recalled that, in order to satisfy the demand for electricity from the shipyards and elsewhere, two steam turbo-generators had to be commissioned in a temporary station, being later transferred to their permanent positions in the new power station which was formally inaugurated three years ago.

Fig. 1.—New Coatrol Room ; Belfast Generating Station.

The site of the Harbour power station comprises some 20 acres, and is capable of being developed to the extent of at least 150,000 kW of plant. At the time it was described (ELEC. REV., August 24th, 1923), the plant installed was of 24,000-kW capacity; that is, two 7,500-kVA and one 15,625-kVA, 3-phase, 50-cycle, 6,600-volt sets had been installed, but before the station had been completed, a second large generating set had to be ordered.

Originally both the main and auxiliary plant was controlled by means of ordinary vertical-panel switchboards located on two galleries situated at the permanent end of the turbo-generator room, but a modern control room has since been added, which facilitates the operation of the station materially.

We are indebted to Mr. Johnstone Wright, M.I.E.E., M.I.Mech.E., city electrical engineer and general manager of the undertaking, for the two photographs reproduced herewith which illustrate the two control boards and the large diagrams that have been provided for the guidance of the engineer in control. Mr. Wright is evidently a lover of daylight, for it will be seen that he has arranged for plenty of natural light to enter the room through the glass roof, whilst electric lamps are spaced round the skylight.

This is an excellent feature, for not only does it allow of the four walls of the control room being fully utilised without restriction due to window space, but it is obvious that an abundance of light, both natural and electric, is desirable for more than one reason. A somewhat similar lighting scheme has been adopted at the old East Bridge Street station, which premises have been recently converted into commodious showrooms, with test-house and office accommodation, &c. (see ELEC. REV., April 9th, 1926, page 579).

In this case an existing glass roof has been taken advantage of to ensure that ample light is provided both by day and night; in the latter case exterior roof lighting is employed. Incidentally, it may be mentioned that the offices and showrooms are electrically heated. A control room of the type illustrated herewith is becoming a feature of most of the newly-erected, or reconstructed, electricity generating stations in this country. In large power houses it becomes a necessity in order that switching operations may be carried out in an orderly and unhampered manner, but opinion seems to be divided on the question whether the particular pattern which has been chosen at Belfast is the best. It will be noticed that the room is not provided with ordinary windows, so that this arrangement enables the control engineer to perform his duties undisturbed by happenings elsewhere in the premises during an emergency.

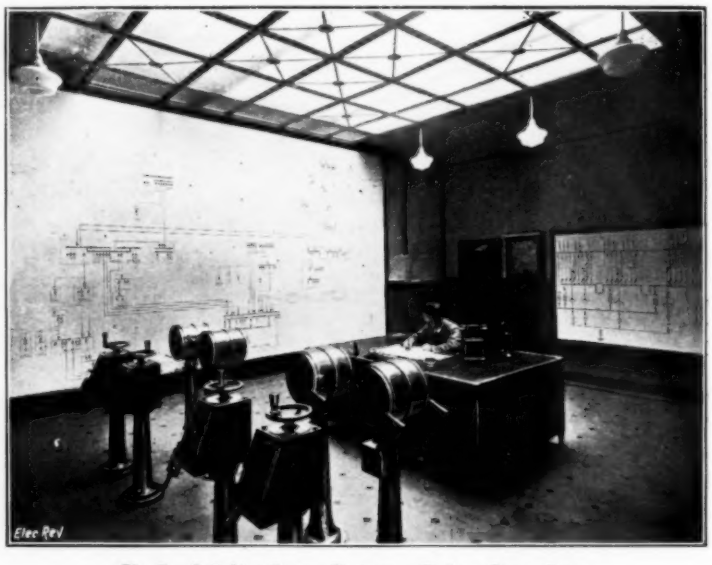


Fig. 2.—Switching System Diagrams ; Harbour Power Stations.

All-Electric Houses at Manchester.

A Public Exhibit of a Modern Small Dwelling.

FURTHER proof—if needed, seeing that practical experience has demonstrated the fact all over the country—of the wisdom of demonstrating the utility and numerous advantages of the all-electric home by means of public exhibition is to be found at Manchester, where a complete electrically-equipped house has been open for public inspection for some weeks.

Known as 189, Errwood Road, Burnage, the house (fig. 1) is situated on one of the Corporation housing estates, and it has been rented by the Municipal Electricity Department from the Housing Department for the purpose of the exhibition. For the photographs reproduced below and the following details of various features of the house we are indebted to Mr. H. C. Lamb, M.I.E.E., M.I.Mech.E., chief engineer and manager of the Manchester Corporation Electricity Department.

Fig. 1.—An All-Electric House at Manchester.

The house in question consists of a small hall, a parlour, a living room, a kitchen-scullery which is illustrated in figs. 3 and 4, three bedrooms, a bathroom, &c., and the following brief description will convey an idea of the manner in which the premises have been electrically equipped.

The rent of the dwelling is 19s. 9d. per week, including rates, and the electricity account will be charged on the "all-in" tariff, which consists of a fixed charge of 20 per cent. on the pre-war rateable value, or its equivalent, and a running charge of ½d. per kWh; in this case the fixed charge is 17s. per quarter.

The front door bell is operated by a transformer from the supply mains.

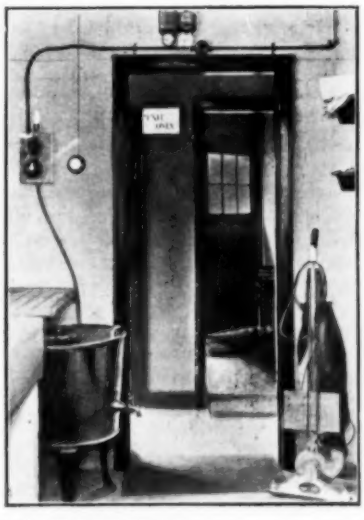
The house has been provided with one coal-fired grate which is fitted in the living room as indicated in fig. 2. This heats the domestic water supply and also an oven which is at the back of the fire-place, and to which access is obtained from the scullery.

Other electrical appliances are displayed in the various rooms which, of course, are not included in the equipment of the house, *e.g.*, table standards, a toaster, electric sewing machine and iron. If any of these appliances are required by the tenant they must be purchased.

The house has been tastefully furnished by Messrs. G. Hardy & Co., of Manchester.

It is interesting to note that over 10,000 people have visited the house during the three weeks it has been open, and keen interest has been shown in the exhibit. The housing estate, when complete, will contain 610 houses, of which 58 are to be electrically equipped in the manner described above.

Fig. 2.—Part of the Living Room.



Figs. 3 and 4.—Views of the Kitchen-Scullery.

All the lighting is done by electricity, besides which electric heating is employed, and two 2-kW fires have been provided; also a 3-kW 10-gallon wash boiler.

A standard cooker is included at the usual rental of 5s. per quarter, which includes a 3-pint electric kettle. Plugs are fixed in each of the living rooms and the bedrooms for heating, and the usual plug for an iron in the scullery.

Electricity in Housing Schemes.—The Sheffield Corporation has provided electrical installations in a large number of the houses built under its auspices, and a great deal of the necessary equipment has been supplied by the General Electric Co., Ltd. Among this are no fewer than 23,000 "Osram" lamps for the houses, as well as a further 2,000 for street lighting. For the latter purpose, too, the company has supplied a thousand swan-neck brackets, complete with d.p. fuses and special reflectors. Other "G.E.C." products purchased for the estates are switches, switch-fuses, cut-outs, ceiling roses, shades, &c. The same company has recently supplied lamps and fittings for the new Nurses' Home at The Retreat, York, the electrical contractors for which are Messrs. Hall & Stinson, Ltd., of Sheffield.

Psycho-Technical Vocational Selection.

By Major E. A. PELLS, A.M.I.E.E., M.I.S.M.A.

ALL those who have control of labour, from the directors of our largest industrial establishments downwards, are agreed as to the difficulty of always finding the right individual for each job. The introduction of psycho-technical examination as to the aspirant's fitness for a particular operation or profession places in their hands a definitely scientific method of ascertaining whether any individual posseses, to a sufficient degree, the qualities and faculties required for a certain post. This method of testing provides an efficient means of eliminating a great deal of labour wastage and spells economy of employés. Without such a system of testing it may be laid down definitely that complete efficiency is unattainable.

A full measure of success in psycho-technical selection can only be attained if the apparatus used is the result of scientific calculation and design. Experienced psychologists have for some time past been devising means by which tests can be carried out in as practical a manner as possible, and yet in strict conformity with the laws governing the science of psycho-technical selection.

The German State Railways have psychological offices where research, and the practical application of the science, go on side by side, and some of the apparatus designed for this purpose is very ingenious. The apparatus for examining drivers is most interesting, and gives a clearly defined test as to the fitness of the aspirants to be employed as drivers. The apparatus is so arranged that not only do they have to watch the road ahead and conform to the general happenings, but also they must look after their controls in exactly the same way as though on the footplate. As the man starts his engine a track commences to move towards him, showing signals, &c., which have to be observed and acted upon. There are automatic counters which register all faults against the man under test, so that it is not just a rule-of-thumb test, which a stroke of luck may get a man through successfully. This apparatus can also be used for the training of drivers, so that as the pupil sees the track moving towards him, showing all the signals, notices, and warnings he is likely to meet in practice, he quickly becomes used to the various professional tricks and grows intimate with the drivers' technique. The elimination of breakage of plant due to learner drivers, without counting the wear and tear of instructors' nerves, is a matter of some moment, apart from the certainty of putting only men on the road who are psychologically well equipped to act as drivers.

There is a similar apparatus for the testing and instruction of chauffeurs, in which case the man under test is seated in an exact replica of a driver's seat on a car, complete with all instruments, &c., and sees a road moving towards him with various vehicles and obstructions appearing which call for special negotiation, also corners and gradients all arranged in a most ingenious manner.

Other machines are designed to test specific performance on the part of the examinee. There is a moving ribbon apparatus which shows certain signs and groups of letters through a small window in a cabinet, the person under test having to press a button whenever a certain sign or group occurs. There are disk sorting machines of various kinds, with a machine which delivers the disks at a determined speed, one at a time.

A board covered with bolts, bars, shackles, and locks is used for testing the aptitude of the examinee to carry out instructions quickly and without error. The finger joint tester enables a test to be taken of the sensibility of the finger joints, and their power to discern slight differences of pressure.

There are optometers for testing the ability of a candidate to measure distances of an equivalent character with the eye, and a machine with three moving strips, with certain lines which coincide at varying intervals, when the examinee has to press a button, by which means it can be shown whether he is inclined to anticipate or delay, or whether he is always quite punctual.

These and other machines are the outcome of years of study of this most interesting subject, and by their utilisation in industrial organisations the avoidance of "square pegs in round holes," by the correct use of the science of psycho-technical selection, should solve the problem of labour wastage.

Rural Electricity Supply in France.

FRANCE is a strange mixture of the old and new. One can see an ox-wagon moving along a country road, without hedges, where the land may be still chopped up in little detached clumps as it was in England many years ago before the much-abused Enclosure Acts came into force, and alongside the road can be seen perhaps a three-phase power line at 15,000 volts, or even at a higher pressure, which brings power from a waterfall or steam station that may be many miles away. One may hear the buzzing-hum of a thrashing machine, which reminds one of joyous youthful days with the rats, dogs, and many sticks, and when wondering at the absence of the puff-puff of the portable engine, one comes upon a farm whereon the gear is driven by an electric motor. One can see peasants in their fête-day old-world costumes on a village green enjoying themselves under a simple electric light standard, and note that they live in a cottage with electric light in the parlour, and hear that if the son and heir breaks a lamp in his play, although the cost of living has gone up by leaps and bounds, the father of the family can get a new one for about 6d. or 7d.

In various countries of the world, and even in different parts of the same country, different laws of physics seem to rule, something like the different wars that branches of the same army were often fighting during the great war.

A low-pressure stranded house-distribution overhead main, supported on a steel pole, must, it seems, be far more dangerous to the helpless community at home than a 15,000-volt line alongside a high road in France, with twenty times the traffic.

Nature is at times very accommodating, because in some places in England, where the tramways belong to the people and relieve the rates (positively or negatively), a solid trolley wire can be seen hanging over return rails on a wet day, its tensile stress upset by the heat of a soldering lamp, and banged every few seconds by a trolley wheel, and one can only assume that it is prevented from becoming a death-dealing sword of Damocles by a row of invisible providential sky hooks.

There is an old mill not far from the source of the Seine; the owner, largely as a hobby and employment for one of the younger generation of his family, before the war arranged to supply a village a mile or more away with electric light. A three-phase alternator of about 40 kW wound for 3,300 volts was driven by an old turbine. When the war came on the "electrician-wireman-managing director" was called away; men of the "King Pataud" type were made to behave themselves in France, and electricians there had to do their duty like men of other crafts. The duties of station engineer and assistant engineer fell respectively on the old man and his wife, both apparently eligible for the old-age pension, and to see the old lady, a shameless blackleg, start up the plant at sundown ought to have given such a shock to the ether of Europe as might have shaken the fuses at the Albert Hall out of their sockets.

As something like a dozen French makers of electrical plant before the war had stock patterns for 3,300- or 5,000-volt alternators from about 30 kVA upwards, presumably the generating plant was originally purchased "off the peg" without, say, 50 pages of "different from the usual" specification, although how

a plant of this output can have been kept going at 3,000 volts without spare gear, for ten years or more, is likely to remain a mystery within a shilling taxi-fare radius of Victoria Street; without step-up transformers and a Christmas-tree of gadgets, the plant ought naturally to have broken down something like 365 times in a year.

There is another point: how could France call herself progressive and civilised, unless the cost of the provisional order (or whatever they call it there) came to more than that of the transmission line and step-down transformers? One wonders whether such a plant was originally inaugurated at 9 a.m., with the Mayor and Prefect and a row of gentlemen in top hats and evening dress, or whether the old miller simply switched on the "juice."

In England, perhaps, one can imagine the vast building (*vide* local Press) packed with an assembled multitude in its Sunday best, and amid an awe-inspiring hush the lady mayoress would cut a one-and-eleven-three bit of ribbon and pull a lever or something. After these super-arduous duties a representative of a contractor would present a diamond tiara to the lady in question, a box of flor-de-cabagissimos with an insurance policy inside the lid to the mayor. Later another contractor's representative would proclaim to the select assembly that the "Alphonse" who had chosen his firm to supply some of the gear was an engineer who, in ability and acumen, was one of the greatest rivals to Leonardo da Vinci and Edison.

One thinks of a village comparatively near London, with a high-pressure main not much more than 2½ miles away, where there are about 150 telephone subscribers and no public supply of electricity. The very thought of an overhead high-pressure main would upset the digestive apparatus of the patient baa-lambs in the neighbourhood. A company comes along and offers to supply light at 1s. per kVA, a price apparently far higher than thousands of French consumers can get it at from companies using English coal, and as there is gas in the district at a reasonable rate, the bulk of the residents in that district say "we do not want the light at that price, thank you very much," and small wonder. They say to their friends, they will take it when the price comes down—so the inhabitants have to wait and see.

The Association of Mining Electrical Engineers.

Address by the New President.

AT the annual general meeting of the above-named Association, which was held at Harrogate in June, Mr. David Martin, O.B.E., M.I.E.E., in the course of his presidential address remarked, *inter alia*:—

In the discussion arising out of three papers read before the I.E.E. in April, 1926, suggestions were made that the I.E.E. Council should appoint a committee to ascertain how the use of electricity in mines could be furthered, while another speaker referred to the greater need of educating miners how to use and maintain electrical machinery in mines in such a condition as to avoid accidents, and also suggested that the point be taken up by the I.E.E., or some other responsible body. Two of the authors and one of the speakers referred to are members of the Association of Mining Electrical Engineers, which I would suggest is the Association entitled to be encouraged to handle and discuss these problems. Further, there is no necessity for another body to make what would be an overlapping inquiry into subjects that have been, and still are, subjects of immense and vital interest to this Association, which was incorporated in January, 1911; has an active membership of over 2,150; has encouraged the better education of those in charge of electrical gear in mines, and as a result has issued over 500 certificates to those who have passed the Association's examinations.

To ignore the efforts of this Association in this connection on a public occasion does seem to display a lack of loyalty, but perhaps one would not be justified in saying it was wilful. The discouragement to further, and an accelerated rate of progress in, electrification schemes in mines is, in the main, due to the general lack of stability in the coal-mining industry, and it would be worse than useless for our Association to attempt to dogmatise on a matter which has baffled so many Government commissions and committees of inquiry. The coal industry is one in which there has been far too much legislation. It is unique in that a miner is not a free agent. In no other industry are there so many Government forms to be filled up. It is a glaring foretaste of what nationalisation would mean. This lack of stability, or settling down to business, is having a most demoralising effect upon the *personnel* of collieries. There is far too much reliance upon the Government of the day to intervene in matters with which it can only have a casual acquaintance. However distinguished a commission may be, it has to be first educated in the affairs of the industry before it can, with any semblance of impartiality, pass judgment upon highly technical details. This it does in as many weeks as it takes years for those in the industry, with much labour and experience, to accumulate and assimilate. What else can one expect but lack of confidence and rankling injustice inherent to all hasty conclusions arising therefrom. A halt should now be made. Let the industry examine and settle its own differences, without Government intervention; both sides are strong enough to make a collective bargain.

Of all the scientific societies I know, ours is the only one which has not increased its subscription from its pre-war value. Measured by others, we are attempting the impossible, and it is only by the most careful attention to details that we are able to make ends meet. Compare our status with that of the Institution of Electrical Engineers, which is now over 12,000 strong, has an annual income exceeding £30,000, and tremendous influence. Sometimes I think we made a mistake in not becoming a section of the larger Institution. I merely cite the comparison as a partial answer to the question of why this Association does not do more to improve the status of its members. Until we get more money we cannot participate in those affairs which are deciding factors in the practice of electrical engineering in and about collieries. In our present condition the mining electrical engineer must perforce remain the Cinderella of the industry.

Electricity Generation.

The public Press has been full to overflowing with visions of a perfect existence with an unlimited supply of electricity "on tap" to do everything and anything. In a modern power house we only get something like 20 per cent. efficiency, and one kWh is produced by burning from 1.25 to 2 lb. of coal. A modern power station of, say, 100,000 kW, will need from 700 to 1,000 tons of coal per day on a 50-per-cent. load factor, while the water required will be from 1½ to 2 million gallons, which will weigh from 7,000 to 10,000 tons. Taking deadweight alone, it will be 10 times cheaper to move the coal than the water.

Of prime importance is the size of a generating station, and on that point there is still considerable difference of opinion in this country. The largest in this country, so far, is Dalmarnock (Glasgow) with 150,000 kW of generating plant, while in the U.S.A. there are several of 400,000 kW capacity. Present opinion in this country seems to favour 250,000 kW as the limit, while in America 500,000 kW appears to be favoured. That is a matter of opinion, but the Electricity Commissioners' report shows that there was generated in the United Kingdom in 1924 some 6,681,514,272 kWh of electricity in 541 generating stations for an expenditure of 7,527,306 tons of coal, which means an average consumption of 2.52 lb. of coal per kWh. The average consumption of coal per kWh at eight of the principal world super-stations was 1.56 lb. in November, 1925, or a saving of .96 lb. of coal per kWh, which, on 6,681,524,272 kWh, is equivalent to a saving of 2,863,510 tons of coal. Two American stations show consumptions as low as 1.25 and 1.21 per kWh, and one English station as low as 1.4 lb. of coal per kWh. So that with improved consumption in the neighbourhood of 1.4 or 1.5, one could hope to save 3,000,000 odd tons of coal for the same output, which tends to prove the contention of the Government for a series of super-stations.

We must not lose our perspective, however: In the eight world super-stations referred to, the average cost of the coal used was 18s. 1d. per ton in November, 1925, including two stations in America where the average price paid was 24s. 11.3d. per ton, so that for the remaining six stations the average price was 15s. 10d. per ton; therefore, the saving in cash on 3,000,000 tons at 15s. 10d. would amount to £2,375,000, sufficient to pay the cost of one super-station.

Coal Mine Electrification.

According to statistics in the recent report of the Royal Commission on the Coal Industry, the average pit-head price obtained in 1924 was 11s. 1.2d. per ton, and for the quarter ended December, 1925, it was 15s. 11.76d. per ton. The same Commission shows that the production of coal for 1925 was 244,420,000 tons; while 7,750,000 tons were used in the electricity generating stations of this country (U.K.); 16,580,000

tons for power purposes at the collieries, and 6,570,000 tons as miners' coal, all for the year 1924.

These are very impressive figures: Practically 10 per cent. of the coal raised was used by the mines and the miners. The consumption per head of population in the United Kingdom in 1924 and 1925 wes 4.5 tons for all purposes, or for domestic use only 0.72 ton per head, while the relative figures for the mining industry itself are 16 and 3 tons, respectively, approximately. This would seem to point to not exactly waste, but a spendthrift attitude on the part of the industry itself.

The following figures, which afford food for thought in improving efficiencies in another direction of our work, represent kWh of electricity required on a common basis, namely, that of raising one ton of coal to the surface. Conditions vary considerably, but I have summarised them into figures sufficient for my purpose. In the Royal Commission's report examples are given of 613 pits in which the output varies from under 5,000 to over 2,000,000 tons per annum. For winding I received figures varying from 1.5 to 8 units per ton; for pumping, from 0.1 to 6 units per ton; for ventilation, from 1.3 to 6 units; for general pit use, from 1 to 9 units. I have deliberately left out compressed-air plant, although we know from the official returns for 1924 there were 3,784 compressed-air coalcutters in commission. I may be a bit too optimistic, but I think eventually these will be replaced by electric coal-cutters as the progress in flameproofing becomes more universally understood.

From this data I take a total of 14 units per ton raised for all purposes as a working figure, although I am aware there are examples where the consumption is as low as 7, and others as high as 22 units. In the reconstructed mines of Northern France, round about Lens where they go in for grouping, an average figure is 13.5 units. Now, if we take the average consumption of coal used to generate one unit as 1.5 lb., you get 1.5 by 14 equal to 21 lb. of coal required to raise one ton. In 1924 there were 267,120,000 tons of coal raised, and this quantity multiplied by 21 lb. per ton equals approximately 2,500,000 tons for colliery use in place of the 16¼ million tons already referred to. This is based on the assumption that electricity is generated in a modern power plant of, say, not less than 100,000 kW capacity, which satisfies the general scheme of affairs as they exist to-day, so far as outside supply is concerned, all the coalfields being situated in one of the electricity districts into which the country is now divided. The obvious advantage of an arrangement such as this would be the saving of coal.

The Royal Commission's report states that the mines used 16,580,000 tons for their own immediate purposes. This figure, minus 2,500,000, shows an apparent saving of 14,000,000 tons, which, if sold at 15s. 10d. per ton, equals £11,083,000. Not only would this amount of coal be released for other purposes, but oncost charges would be reduced by this amount in cash. Put in another way, the mines of this country in 1924 used 16,580,000 tons at 15s. 10d. per ton (the Royal Commission's figure) for their own purposes. That equals a cash value of £13,125,875, whereas if they had purchased their power from outside sources at 0.5d. per kWh (not an unreasonable assumption when collieries would be considered not only a desirable load nationally, but also in the position of contra accounts as suppliers of coal to the power houses) power would cost them £7,791,000, which, deducted from £13,125,876, shows a saving of £5,334,875 at least, but probably more if pulverised fuel (using up the "duff") becomes the standard we all hope it will.

Electrical Development in Mines.

I have touched on one or two points wherein we recognise that saving could be effected. There are others, but we should not forget it is incumbent nowadays, mainly due to war impoverishment, that we pay for improvements out of revenue, and in that connection it is interesting to note the electrical developments which have occurred in mines. According to official records, the figures are:—

(1)	Number of mines at work in 1924	2,855
	Number of mines using electricity in 1924 ...	1,629
	Difference	1,226
(2)	Total electrical h.p. in 1912 (approx.)	600,000
	Total electrical h.p. in 1924	1,481,932
	Increase (approx.)	881,932
(3)	Number of electric coalcutters in 1915	1,449
	Number of electric coalcutters in 1924	3,046
	Increase	1,597
(4)	Number of other mechanical coalcutters in 1915	1,640
	Number of other mechanical coalcutters in 1924	3,784
	Increase	2,144
(5)	Quantity of coal cut by machines in 1915 (tons)	25,600,000
	Quantity of coal cut by machines in 1924 (tons)	49,951,000
	Increase (tons)	24,351,000

What do these figures mean to us as engineers? They are illuminating, and amongst other things, show how slow the adoption of machine coalcutting is. In 1924 only 18.5 per cent. of the coal raised was cut by machines; in other words, it took 6,830 machines to cut approximately 50,000,000 tons of coal in 1924; therefore, to cut the whole of the 1924 output would have required 34,070 machines, or, allowing 10 per cent. of the coal as being unsuitable for machine cutting, the enormous total of 31,660 machines, and, deducting those already in use, some 25,280 additional machines. Assuming the cost per machine to be not much less than £500, that figure means £13,000,000 fresh expenditure at least, the provision of which is not likely until the industry resumes a more peaceful atmosphere. Then there are conveyors and loading, and also haulage underground, the application of mechanical means to which duties is receiving more attention. We all know the conditions underground, then why add to the disabilities further insanitary conditions incidental to the use of ponies which could be avoided by mechanical haulage, and in this way help to reduce the burden of £3,000,000 per annum which has to be found for workmen's compensation? This is a small matter relatively to the enormous oncost of the roads' upkeep for ponies.

Electrical Accidents.

Accidents due to electricity show a marked improvement, probably due to the increased knowledge of the subject. The annual death rate from accident underground, from all causes, was (according to the Royal Commission) 1.13 per thousand, while the electrical fatal accidents total for the years 1922-24 was 28, or 9.3 per annum, or 0.007 per thousand. Calculated on a horse-power basis, there were 13 fatal electrical accidents in 1913 and 371,422 h.p., or 1 death per 28,570 h.p. installed; while in the last three years the deaths were 6, 9 and 13, respectively, or an average of 9.3 per annum, and the h.p. of motors installed was 688,000, 753,000 and 810,000, or an average of 750,000 h.p., which gives 1 death per 80,600 h.p. That is to say, increased knowledge has reduced the chance of fatal accident approximately to a third. In 1921 there was only 1 death, and the h.p. installed was 644,000, a unique experience.

H.M. Electrical Inspector's report shows that the majority (23 out of a total of 91 in the last 10 years, or, roughly, 25 per cent.) of the fatal accidents involved trailing cables, while 21 out of a total of 57 non-fatal accidents in 1924 also involved trailing cables. It is significant that this is the only part of the electrical circuit where it is not compulsory to armour the cable, although flexible armoured cable is now available. I understand the main objection to the general adoption of the latter type is mainly due to the difficulty of making a satisfactory repair in the flexible armouring. The advantages of this type are obvious, and there is scope here for the inventor to develop a suitable joint which will retain flexibility after a repair has been made.

Oil Competition.

Towards making the great mining industry not only a desirable source of revenue to investors, but also a better paying proposition to the wage earners, the first essential is fresh capital expenditure. Is this likely to be forthcoming in the present disturbed state of the industry? Personally, I do not think so. We are apt to overlook the enormous inroad oil has made. In 1924 we imported £24,000,000 worth of oil, much of which could be obtained from coal. In winning a ton of coal in Britain, approximately 10s. is absorbed in labour, whereas in barrelling a ton of crude oil from a gusher about 1s. is expended in labour, which fact is one of the most potent reasons why we should do our utmost to assist the introduction of labour-saving devices, with a view to keeping the cost of the coal as low as possible, if we are to retain our position in the world's markets. The export of coal from Britain fell from 88¼ million tons in 1913 to 69 million tons in 1925, whereas our population is increasing at the rate of 250,000 to 300,000 per annum, which widens the gap between exports and imports still further.

Electricity Restores Gas Service.—A somewhat unusual application of electricity to clear a tar blockage in one of the gas mains of the Burlington (Vt.) Light & Power Co. of America is mentioned in the *Illuminating Engineer*. Winooski, a city of 6,000 inhabitants, is served by a low-pressure distribution system supplied through a three-inch high-pressure main from the Burlington gas plant, three miles away. One morning the office began to receive numerous calls of "no gas." The ordinary measures did not answer, and so the line was uncovered at various points, tapped, and fitted with risers. When a tap was made at one point the pipe was found to be one-third full of solidified tar, the hardness of which resisted penetration with a knife. A bank of a.c. transformers was set up and 400 amperes at 220 volts applied to the pipe, along with an air pressure of 80 pounds per square inch from a portable compressor. In less than an hour under this treatment the riser at the lower end commenced to emit a string of tarry matter which had evidently been warmed just enough to provide a sliding medium under this pressure. The pipe was then cut, a section removed, and the same treatment applied. During several hours a total volume of solid matter equal to approximately one-third of the total volume of the 700-foot section was discharged from the pipe at various intervals. Some pieces of solid matter 15 feet in length and equal in diameter to the size of the pipe were blown out. Without the simultaneous application of heat and pressure it is doubtful if the main could have been cleared, except by working on much shorter sections which it was desired to avoid on account of the newly-paved street.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

The British Industries Fair.—It is reported that over 400 firms have already booked space at next year's British Industries Fair; Birmingham especially has experienced a heavy demand.

Railway Power Station Employés' Wages.—In a recent award the Industrial Court decides that the "prosperity" bonus of 6¼ per cent. paid in the electricity supply industry shall no longer apply to the employés in power stations owned by railway companies in view of the period of depression through which the companies are passing.

A Peel-Conner Tableau.—At a recent carnival in aid of the Coventry and Warwickshire Hospital the Peel-Conner Telephone Works entered a decorated vehicle bearing a "listening-in" exhibit, which secured the first prize in the manufacturers' class. The vehicle was one of the firm's lorries outlined in coloured roses. There were three compartments, one showing "Darby and Joan" by their fireside, one a hospital ward with patients and a nurse, and the other an aeroplane over a Coventry landscape containing a model of the Peel-Conner Works. Six "Gecophone" loud speakers were installed on the lorry to enable the general public to hear the broadcast programmes.

Recent Contracts.—THE METROPOLITAN-VICKERS ELECTRICAL CO., LTD., has recently received two important orders for hydro-electric plant. The first is for three 14,333-kVA vertical type alternators for the Cia. Hidro-Electrica Volcan, Santiago (through the Whitehall Securities Corporation, Ltd.). These sets are for a new station which is being built on the Maipo River, in the high Andes. They will be linked up with four existing hydro-electric stations which provide power for industrial works and electric railway operation over an extensive area between Santiago and Valparaiso. The other contract is for two horizontal water-wheel type alternators, each of 5,000-kW capacity, and five 1,650-kW rotary converter sets, for the Broken Hill Development Co., to provide power for the company's lead and zinc mines. The station is on the Mulungushi River, and the initial equipment consisted of a 2,500-kW Metropolitan-Vickers water-wheel alternator. The rotary converters will be connected in pairs, with one machine as spare, each pair giving supply to a group of 72 electrolytic cells.

Among the orders recently received by Medway's Safety Lift Co., Ltd., are one for a high-speed passenger lift for the reconstructed premises of Messrs. Dawson Bros., City Road, and one for a lift for the Nurses' Home of the Greenwich and Deptford Hospital.

Discount for Municipal Employés.—Complaint was recently made against the practice of the Bradford Electricity Department in giving a discount to Council employés and members who purchased electrical appliances. It was stated that the privilege was abused in that articles were purchased for re-sale. A sub-committee appointed to investigate the matter recently reported that there was no foundation for the allegations, and recommended the continuance of the system. The Council approved the recommendation.

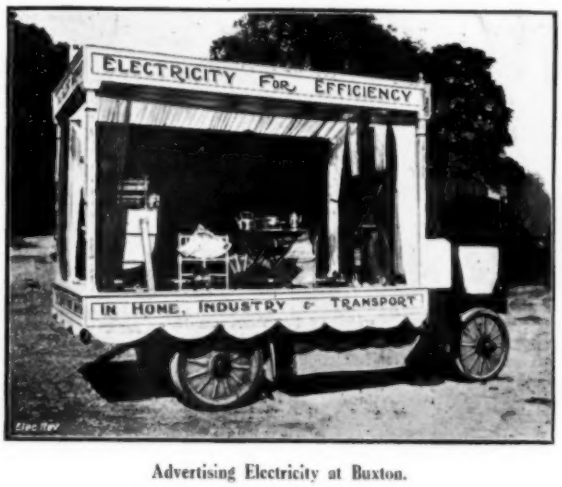
Aluminium in Germany.—It is reported from Breslau that the aluminium concern of H. Bergius and Company has asked the Government, as is necessary under the demobilisation laws, for permission to discharge four-fifths of the men employed at the company's industrial installations in the district of Breslau owing to the production of aluminium having become unremunerative consequent upon the high railway rates for the transport of alumina. While the South German aluminium works have obtained low rates for the conveyance of alumina, such rates have not been granted to the works in the East so that the latter have been deprived of their competitive capacity and must shut down.

Leeds Tercentenary Celebrations.—The 300th anniversary of the granting of the city's charter of incorporation was celebrated last week on a grand scale. The features included a shopping week and window display competition, illuminated public and private buildings, special street illuminations and decorations, a series of gorgeous illuminated tramcars patrolling the city and surrounding districts, an "Old Leeds" Exhibition, a Modern Trades Exhibition, an Industrial Exhibition, a military tattoo, bands, entertainments, &c. The City Electricity Department was called upon heavily in the provision of public decorative lighting schemes and for current for private schemes and shop window shows, and the city electrical engineer (Mr. C. N. Hefford), and the tramway manager (Mr. J. Chamberlain), were members of a small committee of public officers which was responsible for the conversion of the stone and concrete space around the Black Prince statue in City Square, into a charming garden of green lawns and masses of midsummer bloom, lighted at night by coloured illuminations. The Electricity Department erected near the Town Hall a fully-equipped all-electric bungalow, which stood side by side with an all-gas bungalow of similar character. The Electricity Department now has nearly 40,000 consumers, and sells 100 million kWh per annum. During its comparatively brief history, the undertaking has contributed some £350,000 in relief of rates.

Domestic Electrical Appliances in Australia.—Criticism continues to be directed against Sir John Monash on account of his recent statement that the poor progress of electrical appliances for domestic use in Australia was due to the high prices charged for them, fostered by protective tariffs. Mr. J. L. Holt, the secretary of the Electrical Manufacturers' Section of the New South Wales Chamber of Manufacturers maintains that the real cause of the trouble is the high price of electricity. Sir John Monash said that the duty on electrical appliances was 50 or 60 per cent., but Mr. Holt says that the highest duty is that on electric motors, which is 45 per cent. under the British preferential tariff and 60 per cent. under the general tariff. The Tariff Board Act, he says, guards against the charging of excessive prices by manufacturers, and the latter have not taken advantage of the duties. It is claimed that the prices of appliances in Australia are no higher than those in other countries.

Norwegian Customs Duties Increased.—The Storting, on July 9th, adopted a Bill providing for an increase in the temporary addition to the Customs duties on goods not covered by trade treaties, from 33⅓ to 50 per cent. This measure has been adopted in order to compensate the revenue for the loss occasioned by the reduction of the gold surcharge on customs duties owing to the rise of the Norwegian kroner.—*Reuter* (Oslo).

An Ancient Custom and Modern Methods.—The time-honoured custom of "well-dressing" was the occasion of three days' festivities at Buxton recently, and one of the events was a procession of decorated vehicles. Among these was an electric vehicle lent by the D.P. Battery Co., Ltd., to the Corporation Electricity Department, which decorated it and equipped it with examples of domestic electrical appliances. A picture of the car accompanies this note.



Advertising Electricity at Buxton.

New Italian Companies.—A new company, with a capital of 4 million lire and the title La Società Ansaldo-Lorenz, is being organised in Genoa to carry on the amalgamated businesses of the Società Italiana Lorenz, of Genoa, manufacturers of telephone apparatus, and the Ansaldo concern. Other new Italian companies are the Società Idroelettrica Sile, of Treviso, with a capital of 100,000 lire, and the Società Industrie Elettriche, Carolei (Cosenza), capital 600,000 lire.

E.D.A. Activities.—The British Electrical Development Association has issued a pamphlet (E.D.A. 642) which explains in simple terms the economic basis of electricity charges. It is designed to show the consumer or prospective consumer the necessity and equity of different rates for lighting and power.

The Register of Electrical Contractors.—At a meeting of the Executive Committee, held on July 9th, the following were accepted for membership:—

Drabble, H. E., Staveley, near Chesterfield.
Skewes, W., & Co., Ltd., Doncaster.
Brunswick Engineering Co., Ltd., London, N.1
Hallam, J. E., & Sons, Stockport.
Jackson, F. S., Halifax.
Phillips & Dart, Worthing.
Brown, Cranmer, R., Ltd., Hull.
Moran, W. J., Swindon.
Rigby, Thos., Ltd., Leeds.
Levine, B., London, W.
Bailey, Charles W., Chadwell Heath.
Stillingfleet & Harper, Brighouse.
Needham, B., & Sons, Bakewell.
Laidler, J., & Sons, Durham.
Crowborough District Gas and Electricity Co., Jarvis Brook, Sussex.
Cuthbertson & Co., West Hartlepool.
Mauger, Clifford H., Newcastle-on-Tyne.
Laing, J. C., Aberdeen.
Bailey, Thomas J., Brighton.

At the same meeting 14 applications were declined.

Holidays.—The works of the LONDON ELECTRIC FIRM, Croydon, will close at noon on Saturday, July 31st, until Monday, August 9th.

THE ELECTRIC HEATING CO.'s Croydon works will be closed for stocktaking from July 31st to August 3rd inclusive.

The works of MESSRS. ERNEST F. MOY, LTD., will be closed from the evening of July 23rd, until the morning of August 3rd.

New French Company.—La Société des Appareils et Chaudières Electriques Sauria is the name of a new company which has lately been formed in Lyons (31, Rue d'Hôtel de Ville) with a capital of one million francs, to manufacture electric heating and steam-raising apparatus.

Trade Announcements.—MESSRS. HOOK & WILLIS, LTD., of London, have appointed Mr. F. G. Anderson, of 100a, George Street, Edinburgh, as their representative in Scotland.

The head offices of MESSRS. HENRY WIGGIN & CO., LTD., have been transferred to Wiggin Street, Birmingham. Telephone No.: "Edgbaston 2245"; telegraphic address: "Wiggin, Birmingham."

THE ELECTRIC CONSTRUCTION CO., LTD., of Wolverhampton, has acquired the electrical business of Messrs. Sandycroft, Ltd., and Mr. L. J. Hunt has entered into an agreement with the company to act for it in a consulting capacity for the design and sales of Cascade induction and synchronous motors and self-paralleling alternators. His offices are at 4, Broad Street Place, E.C.2.

MESSRS. W. G. MAYER & CO. announce their removal to a much larger factory, Whitecross Works, 47, Great Guildford Street, S.E.1.

Catalogues and Lists.—MESSRS. BLACKSTONE & CO., LTD., Stamford.—A brochure describing, with illustrations, the "Blackstone" unchokeable pump.

THE ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, W.C.2.—Publications No. 769, dealing with the various types of power transformers constructed by the company; and No. 770, describing 33,000-V shell-type transformers for outdoor service, as recently supplied to the Liverpool Corporation.

THE LONDON ELECTRIC WIRE CO. AND SMITHS, LTD., Playhouse Yard, Golden Lane, E.C.—A pamphlet advertising "Lewcos" Association wires and cables.

MESSRS. EVERSHED & VIGNOLES, LTD., Acton Lane Works, Chiswick, W.4.—List No. D156, dealing with an electrical tachometer for power station, marine and other uses. Illustrated.

SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., 38-39, Upper Thames Street, E.C.4.—July price sheet of electrical materials and appliances. Illustrated.

THE JEWEL PEN CO., LTD., 21-22, Great Sutton Street, E.C.1.—An illustrated price list of valve-holders, coil-holders, and other radio components.

BRITISH INSULATED CABLES, LTD., Prescot, Lancs.—Catalogue P.199, illustrating and describing "Prescot" terminal boxes and sealing ends for various types of cables.

DELCO-REMY & HYATT, LTD., 111, Grosvenor Road, S.W.1.—A price list of electric horns of various patterns.

MESSRS. WARD & GOLDSTONE, LTD., Frederick Road, Pendleton, Manchester.—Catalogue No. R/114, containing illustrated particulars and prices of radio receiving sets and components.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—The "Osram Bulletin" for June, containing illustrated articles on "Osram" lighting installations; "Osram" valves, and their correct use; portable radio sets, &c.; also Bulletin No. 14, dealing with the "G.E.C." (McColl) system of protection for generating plant and transmission systems.

THE IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, E.C.4.—Illustrated pamphlets advertising the company's six-valve "superheterodyne" receiver outfit, inductance coils, and "low-loss" dual condensers.

MESSRS. E. BROOK, LTD., Empress Works, Huddersfield.—A pamphlet advertising the company's ball-bearing motors.

MESSRS. D. ANDERSON & SON, LTD., 63, Fenchurch Street, E.C.3.—A treatise on the structure and use of stabilised bitumen ("Stablex.")

THE SAXONIA ELECTRIC WIRE CO., LTD., Roan Works, Greenwich, S.E.10.—A net trade price list of insulated round magnet wires.

THE HART ACCUMULATOR CO., LTD., Marshgate Lane, Stratford, E.15.—A list of "Hart" batteries suitable for replacement purposes for all makes of British cars; and an illustrated price list advertising tanks for dilute acid or distilled water.

MESSRS. SIMPSON, BAKER & CO., 2-5, Nelson Street, Bristol.—A catalogue, illustrated in colour and priced, of table standards, lanterns, bowls, and other lighting fittings, as well as irons and kettles.

SIR W. G. ARMSTRONG WHITWORTH & CO., LTD., 8, Great George Street, S.W.1.—Brochure No. 344, containing exhaustive details of steels for general purposes, with particulars of their mechanical and physical characteristics. Illustrated.

Bankruptcy Proceedings.—A. PACY, J. PACY, and R. FEITELSON, trading as the Compton Wireless Mfg. Co., 26 & 28, Bartholomew Square, E.C.—The first meeting of creditors was held on July 7th, at the London Bankruptcy Court. The debtors filed their petition on June 23rd, and lodged accounts showing joint liabilities of £3,134 (unsecured £2,552), and net assets valued at £1,407. According to the debtors' statements in preliminary examinations the debtor A. Pacy, before starting business as a wireless manufacturer, had traded for several years as an importer of fancy foods. Early in 1924 a suggestion was made to him that he should join his brother and the debtor Feitelson in partnership. The debtor says that he paid up all the liabilities of his business. In March, 1924, a partnership deed was formally drawn up under which he and the other two persons mentioned became equal partners, his share of the capital being £250, represented by cash and office fittings, &c., from his old business. The new firm acquired premises at Bartholomew Square, City, and until within a year ago they did good business. Then a slump set in, and, in addition, recent labour troubles had adversely affected the business. About three months ago creditors began to press the firm for settlement of accounts, and some time in December they were served with their first writ, relating to a sum of £340; that was duly paid. Afterwards other creditors began to press, and on June 14th the firm called together the whole of their creditors, a judgment creditor having levied an execution on their stock and effects. A day or two later an additional levy in respect of a sum of £177 was made. A further meeting of the creditors was held, when an offer was made to pay a composition of 5s. in the £. The debtors were advised to file their petition in order to protect the general body of the creditors. All the effects had been realised except a few tenant's fixtures, &c., and the business was now closed. A resolution was passed for Mr. W. A. J. Osborn, accountant, Balfour House, Finsbury Pavement, E.C., to act as trustee and wind up the estate in bankruptcy.

E. H. TANSEY, 65, Factory Road, Hinckley, Leicestershire, radio dealer.—The public examination of this debtor was held recently at the Castle, Leicester. The statement of affairs showed gross liabilities of £281, and there was a deficiency of £200. Debtor stated that he commenced business in May, 1923, without capital, while he had had no actual experience of the radio trade. He obtained goods on credit through the recommendations of friends. He had not kept a full set of books. The examination was closed.

A. E. RANDLE, telephone engineer, 87, Edward Street, Nuneaton.—Receiving order made July 5th, on debtor's own petition. First meeting, July 19th, at the Official Receiver's office, 9-11, High Street, Coventry; public examination, August 9th, at the County Hall, Coventry.

C. J. NICHOLS (C. J. Nichols & Co.), electrical engineer, 7, Park Street, Bridgend.—Trustee, Mr. G. G. Poppleton, 26, Corporation Street, Birmingham, appointed July 6th (in place of Mr. C. T. Appleby, deceased).

F. P. CRAWLEY, electrical, radio and motor-car engineer, late of the New Central Garage, 30, Mincing Lane, Blackburn.—Trustee, Mr. A. T. Eaves, 47, Mosley Street, Manchester, released June 8th.

W. T. ROBINSON and H. ATTERBY (J. P. Beckett & Co.), electrical engineers, 134, Victoria Street, Gt. Grimsby.—Trustee, Mr. S. M. Forrester, released June 16th.

D. M. STRODE, engineer, 44-50, Osnaburgh Street, E.C., and 6 and 7, Creed Lane, E.C. Receiving order made July 1st, on debtor's own petition. First meeting, July 19th; public examination, August 24th, both at Carey Street, W.C.

W. J. WARREN (Coleman & Warren), wholesale electrical supplier, 66, Victoria Street, S.W.—Receiving order made July 2nd, on debtor's own petition. First meeting, July 21st; public examination August 24th, both at Carey Street, W.C.

E. D. S. MUNDAY, electrical engineer, 272, Lake Road, Portsmouth.—Receiving order made July 1st, on debtor's own petition.

J. G. F. RENNIE, electrical engineer, 4, Mylen Road, and 19, Bridge Street, Andover.—Receiving order made July 1st, on debtor's own petition.

C. W. A. ASHWORTH, electrical engineer, West Street, Oundle.—Trustee, Mr. J. L. Poland, Official Receiver, 5, Petty Cury, Cambridge, released June 29th.

N. P. JONES, electrical engineer, 23, High Street, Denbigh.—Trustee, Mr. J. D. Hooson, Official Receiver, St. Peter's Churchyard, The Cross, Chester, released June 30th.

D. E. DAVIES, wireless engineer, 19, Poulton Street, Kirkham.—Last day for proofs for dividend, July 20th; trustee, Mr. H. Parker, Official Receiver, 11, Winckley Square, Preston.

T. N. SHEPHERD, plumber and electrical engineer, 15, Bridge Road, Stockton-on-Tees, and 5, Queen Street, Redcar.—Last day for proofs for dividend, July 22nd; trustee, Mr. C. Turner, 155, Norfolk Street, Sheffield.

F. & C. H. VIGERS.—The report of the trustees shows that a dividend of 6d. in the £ has been paid on claims amounting to £126,658.

Company Liquidations.—POWER AND LIGHTING SUPPLIES CO., LTD., 25, Blackfriars Street, Salford, electrical engineers.—A meeting of creditors was held on July 6th, at the offices of Messrs. Harry L. Price & Co., Manchester. The chair was occupied by Mr. A. T. Eaves, the liquidator of the company, who submitted a statement of affairs which showed ranking liabilities of £1,031, of which £823 was due to the trade and £208 to the bank, and net assets of £143, or a deficiency so far as the creditors were concerned of £888. As regarded the shareholders there was a deficiency of £3,013. The company was formed in 1920, the issued capital being £2,125. It took over an existing business, and during 1921 there was a loss on the trading of £484. The following year there was a profit of nearly £500, but thereafter losses were incurred. The deficiency was accounted for by losses on trading, together with the depreciation written off the assets in the statement of affairs. A private meeting of the creditors was held early in June, when it was decided that failing an offer of 5s. in the £ the company should go into voluntary liquidation. Following that meeting the shareholders passed the usual resolu-

tion for voluntary liquidation, and appointed Mr. A. T. Eaves as liquidator. The latter stated that the business had been advertised for sale, but without success, and it would appear that a sale by auction was inevitable. No resolution was passed by the creditors, and therefore the voluntary liquidation of the company will be continued with Mr. Eaves as liquidator.

KNOWSLEY ELECTRICAL CO., LTD.—Winding up voluntarily. Liquidator, Mr. T. Robson, 43, Castle Street, Liverpool. A meeting of creditors was held yesterday at the Common Hall, Hackins Hey, Liverpool.

P.V., LTD.—A meeting of creditors is called for to-day (Friday, July 16), at the office of the Liquidator, Mr. G. L. Campbell, 3, York Street, Manchester.

TOPSHAM ELECTRICITY SUPPLY CO., LTD.—A meeting of members is called for August 11th, at 23, Catherine Street, Exeter, to hear an account of the winding up from the Liquidator, Mr. A. L. Honey.

Private Arrangements.—C. WOODHEAD, trading as Woodhead and Partners, electrical engineers, Basinghall Street, Leeds.—A meeting of the creditors of the above was held on July 8th at Leeds, when a statement of affairs was presented, which showed liabilities of £1,216 and net assets of £475, leaving a deficiency of £741. It was reported that the business was commenced in 1909 by the late Mr. J. H. Woodhead, the father of the present proprietor. For a time the executors carried on the business, but in July, 1920, the debtor took it over, the purchase price being £1,000. Payments had been regularly made on account of the principal and interest, and at the present time there was £153 owing to the executors. Profits were regularly made in the business up to the end of 1924. The turnover had also been progressive, and in 1924, there was a net profit of £834. In 1925 there was a loss of £60, and up to June 30th last there had been a profit of £80. The drawings had been moderate. A resolution was passed accepting a composition of 7s. 6d. in the £, payable by three equal instalments, at 4, 8, and 12 months, the last two to be secured. The principal creditors are :—

	£		£
Walsall Hardware Mfg. Co., Ltd.	426	General Electric Co., Ltd. ...	40
Electric Lamp Factors	186	Edison Swan Electric Co., Ltd.	25
Liverpool Cable Co., Ltd. ...	100	Belling & Co.	23
Dawson, S.	48		

Dissolutions of Partnership.—SPARKS & PARTNERS, consulting engineers, Blackfriars House, New Bridge Street, E.C.—Messrs. C. P. Sparks, H. C. Sparks, and A. C. Sparks, have dissolved partnership. Messrs. C. P. Sparks and A. C. Sparks will attend to debts and continue the business under the same style.

BENNETT & LATIMER, wireless dealers, 9, East Street, Herne Bay.—Mr. H. H. Latimer and Mr. L. N. Bennett have dissolved partnership. Mr. Bennett will continue the business.

Our Foreign Trade.—The following were the values of imports and exports of electrical goods and machinery during June :—

	June, 1926.	Inc. or dec.	6 months, 1926.
Imports—	£	£	£
Electrical goods and apparatus	252,063	− 8,671	− 378,785
Machinery	1,096,131	+162,996	+ 626,156
(Electrical machinery) ...	126,731	+ 46,458	+ 31,081
Exports—			
Electrical goods and apparatus	820,608	− 24,614	− 930,292
Machinery	3,418,110	−461,598	−1,998,286
(Electrical machinery) ...	353,179	− 86,772	− 290,804
Re-exports—			
Electrical goods and apparatus	10,227	− 4,441	− 45,932
Machinery	110,424	− 5,688	− 80,118
(Electrical machinery) ...	4,700	− 120	+ 6,291

Conditions in Bulgaria.—A report upon this subject has been prepared for the Department of Overseas Trade by Mr. G. Herbert, Secretary in Charge of Commercial Affairs at the British Legation, Sofia. (Stationery Office, 1s. net.) The imports during 1925 showed a substantial increase, but the British share improved only slightly to 13.1 per cent. of the total. The share of Germany, the principal supplier, experienced a decrease. No separate details of electrical imports are given, but " machines, instruments and apparatus," ranking as the third item in importance, were valued at 744 million leva as compared with 469 millions in 1924. The report states that it appears certain that in the near future there will be great activity in hydro-electric and irrigation works. Schools of mechanics and electro-technology have been established at Gabrovo. Mr. Herbert says that " British " is still a synonym for excellence of quality in Bulgaria, and he thinks that United Kingdom manufacturers have not taken full advantage of the opportunities for business in that country.

Canadian Customs Tariff. — The tariff amendments providing, *inter alia*, for the duty-free admission of certain automobile electrical equipment into Canada, have now been approved.

Metal Trades Benevolent Society.—The seventy-eighth anniversary festival of the Royal Metal Trades' Pension and Benevolent Society, postponed from June 1st, has been fixed for Tuesday, November 2nd, at the Guildhall, London. The Prince of Wales will be present.

International Tube Syndicate.—At a recent meeting of the German Tube Syndicate, at which English, French, Swedish, and Danish representatives were present, the International Tube Syndicate agreement was ratified.

Belgian Cable Contract.—It is stated that tenders are being invited in Belgium by August 1st for the execution of an important cable contract. This involves the supply and laying of telephone cables between Brussels and Luxemburg with branch lines to Arlon and Aubange, and the supply and laying of similar cables between Brussels and Mons. Both contracts include all subsidiary equipment necessary for laying and making connections. The first line is to be completed within 400 days and the second in 250 days.

Social Events.—On July 3rd, the annual sports and children's outing of the Yorkshire Electric Power Co. took place at the Rectory Grounds, Thornhill. The arrangements were carried out by a staff committee, under the chairmanship of Lt.-Col. H. C. Fraser, D.S.O., and over 1,300 attended. During the afternoon music was provided by the band of the 4th Battalion of the King's Own Yorkshire Light Infantry. The sports prizes were presented by Mrs. W. B. Woodhouse.

The staff of Messrs. Giddings & Dacre, Ltd., Salford, were the guests of the directors on July 3rd, when a picnic was arranged at Blackpool, the party travelling by charabanc. Dinner and tea were taken at the Palatine Hotel, and during the afternoon a bowling tournament was organised.

The annual outing of the staff of Messrs. Macdonald, Syer and Co., Ltd., took place on July 3rd, Southend being chosen for the event. Mr. C. Stanley Syer, managing director, presided at luncheon.

On July 3rd the General Electric Co., Ltd., held its annual sports at its ground at Wembley. Owing to indisposition, Sir Hugo Hirst, Bt. (chairman) was unable to attend, but Mr. and Mrs. M. J. Railing, Mr. and Mrs. L. C. Gamage, Mr. and Mrs. C. Wilson, Dr. and Mrs. C. C. Paterson, Mr. and Mrs. E. Wilson, Mr. J. W. Stephens, and other prominent members of the organisation were present. The sports programme was a lengthy one, and there was keen competition for the many cups and other valuable prizes. After the presentation of the prizes by Mrs. M. J. Railing, the remainder of the evening was devoted to dancing, which the fine weather favoured.

The annual sports of Messrs. Johnson & Phillips, Ltd., were held on July 3rd, at the company's sports ground at Kidbrook. There was the usual programme of athletic events, serious and otherwise. The prizes were presented to the successful competitors by Lady Dawson, wife of Sir Philip Dawson, M.P., M.I.E.E., one of the directors of the company. An *al fresco* dance agreeably concluded the day's amusements.

The Metropolitan-Vickers Electrical Co.'s annual sports took place at Belle Vue Gardens, Manchester, recently. The weather was fine and a large crowd attended. One of the outstanding items in the programme was a comic football match in fancy dress between home and overseas apprentices. The referee (Mr. E. M. Honey) was awarded the prize for the most bizarre costume by Mr. G. E. Bailey, works manager, and Mrs. J. S. Peck, wife of the chief electrical engineer. A wooden cup, handsomely gilt, was presented to the referee for the winning team, he being the only one who could decide the matter.

The annual outing of Power Contracts, Ltd., took place on July 16th, when a party of 50 enjoyed a river trip from Kingston to Old Windsor. Lunch and tea were served on board, and the day was enlivened with music and dancing. The Sales Department led in a " beauty competition," securing three prizes, the Works Department being a close second.

The Aluminium Corporation in Norway.—The Norwegian Government has under consideration the granting of a concession to the Aluminium Corporation, Ltd., enabling it to develop the Glomfjord waterfall for hydro-electric purposes. The concession provides for the development of the fall in stages up to a maximum of 36,000 kW. The Corporation will form a subsidiary company with a capital of 3 million kroner to harness the falls and utilise the power in the production of aluminium.

Local Exhibition.—GLASGOW.—Carron Company is a prominent exhibitor of electric cookers at a Housing Exhibition being held in Glasgow under the auspices of the *Daily Record* and the *Evening News*. Washing and ironing are being demonstrated by the Hurley Machine Co., whose exhibit includes the new Thor folding electric ironer, in which all operations are automatic.

Wages in the Engineering Industry.—The July *Journal* of the Amalgamated Engineering Union reports that at a meeting of the Central Conference of the engineering industry last month applications for the 20s. per week increase were put in by fifty districts. In presenting these, Mr. J. T. Brownlie, the president of the A.E.U., pointed out that wages in the engineering industry were lamentably low and the advance upon the pre-war rates was far behind the rise in the cost of living. He claimed that " real " wages to-day were only equal to about 85.6 per cent. of the pre-war wages. Mr. W. A. S. Watson (the chairman), replying on behalf of the Engineering Employers' Federation, said that the employers had made a speculative offer to the unions, which would have involved a cost of two and a-half million pounds. The recent disturbances in industry had now made it impossible to pay even that amount for an enormous loss had been sustained. No agreement was reached, the conference concluding with a statement by Mr. Brownlie that the unions would rally their forces with a view to pressing forward their demand for higher rates than were being paid at present.

Lighting and Power Notes.

Argentina. — ELECTRICAL DEVELOPMENT. — At the recent annual meeting of the Société de l'Electricité de Rosario, it was announced that a new 15,000-kW turbo-generator and four new boilers have been completed at the power station and put in operation.

Bacup.—ELECTRICITY CHARGES.—At a meeting of the Town Council, on July 8th, reference was made to arrangements with Rawtenstall Corporation for a revision of charges for bulk supply of electricity to Bacup Corporation. It was stated that the charges up to 50,000 kWh per month remained the same, all energy above this amount had been reduced from .7d. to .65d. per kWh. Owing to the stocks of coal being nearly exhausted it was necessary that the coal clause in the agreement should begin to operate. The price Rawtenstall had to pay for coal would be passed on to Corporation and to local consumers.

Birkenhead.—ELECTRICITY SUPPLY.—The Wirral R.D.C. has decided to adopt the offer of the Corporation to enter into an arrangement to carry out the powers and duties of the Council under the Wirral and Neston Electricity Special Order, 1925.

Blackpool.—REORGANISATION OF ADMINISTRATION.—At a recent meeting of the General Purposes Committee, it was proposed that the Corporation should set up a special transport department and that there should be a separation of the tramways management from the management of the electricity works. The proposal has been rejected by the Town Council.

Bolton. — LOANS SANCTIONED. — The Town Council has received sanction to loans of £20,800 for mains and £13,400 for sub-station equipment. Application is to be made for sanction to borrow a further £25,000 to cover three years' prospective cost of installing sub-stations on consumers' premises and for transformer stations.

Bradford.—PUBLIC LIGHTING SCHEME REJECTED.—The City Council has rejected the proposal for the appointment of a separate Public Lighting Committee and the appointment of a Public Lighting Engineer at a salary of £500 per annum. The recommendation, which had been approved by the Electricity and Gas Committees and by the Finance Estimates Sub-Committee, was an outcome of the recent report by Mr. J. F. Colquhoun, public lighting engineer of Sheffield.

Chelmsford.—ELECTRICITY CHARGES.—The Electricity Supply Corporation, Ltd., has informed the Town Council that while it is unable to agree to a reduction in the present statutory maximum charge, it has been decided to make a voluntary reduction in the lighting rate of 1¼d. per kWh to 9d. less ½d. discount. The Town Council has informed the company that the reduction offered is inadequate, and that unless a further reduction is made the Council will be compelled to again consider the question of applying to the Electricity Commissioners for a statutory revision of the present maximum charge.

Continental.—ITALY.—The Societa Terni has been authorised by the Italian Government to erect an 80,000-V transmission line between its power station at Papigno and the Nera Montoro transformer station in the province of Perugia. The Società Adriatica di Elettricita is also erecting a 125,000-V line between Dolo, in the province of Venice, and Portomaggiore, in the Ferrara province.

The Italian Government has recently granted a concession to the Società Industrie Montanistiche, to utilise the water power of the River Piave, at Perarolo, for the operation of a 17,700-h.p. hydro-electric station. The Società Marchigiana di Elettricita, of Recanati, has also secured powers to erect a 9,420-h.p. plant to utilise the water power of the Assita falls in the province of Macerata.

GERMANY.—Under the auspices of the A.E.G., of Berlin, and the Rhenish-Westphalian Electricity Supply Co., a new company has been formed in Frankfort-am-Main, with the title the Eifel Kraftwerk Gesellschaft, to establish hydro-electric stations, to utilise the water power resources of the Eifel district. It is proposed to create a large artificial lake by means of a dam in the valley of the Our, near the Luxembourg frontier, and to install plant with an initial capacity of 200,000 kW. The complete scheme is for a development of 600,000 kW.

BELGIUM.—A new 4,800/6,000-kW turbo-alternator is being added to the electric power station at the collieries of the Société des Charbonnages de Winterslag.

FRANCE.—The French Government has recently approved a scheme for the establishment of a transmission system with aluminium conductors, to connect the two hydro-electric power stations—one at Las Nades, already in operation, and a projected one at Valentine (Haute Garonne)—of the Société Valentinoise with the hydro-electric station of the Société des Forces Motrices de la Garonne at Mancioux, and also between the station at the last-named place and the electro-chemical works at Boussens. The current will be transmitted at a pressure of 60,000 V.

Coventry.—NEW PLANT.—At a special meeting of the City Council on July 7th, it was decided to amend the plant extension scheme by providing that the normal rating of the two turbo-alternators to be initially installed should be 15,000 kW (instead of 10,000 kW) with an overload rating of 18,750 kW; and that the total estimated expenditure authorised by the Council should be increased from £558,495 to £708,495.

Dalkeith.—ELECTRICITY SCHEME.—The Town Council is to proceed with an electricity scheme involving an expenditure of £13,200, in addition to the purchase price of £18,000 recently paid to the Electric Supply Corporation, Ltd., for the whole of its undertaking at Dalkeith.

Duns.—ELECTRICITY SCHEME.—Steps are being taken to form a company to provide a supply of electricity to the town. The outlay on the proposed scheme is estimated at £3,000.

Ilkley.—LOAN SANCTIONED.—The Urban District Council has received sanction to borrow £16,500 for cables and plant for the extension of the electricity supply in the western area of the district.

Ipswich.—YEAR'S WORKING.—The report on the working of the Corporation electricity undertaking (engineer, Mr. A. S. Black) for the year ended March 31st last, shows a total income of £105,804, as compared with £97,170 in 1924-25. Working expenses increased from £57,340 to £57,516, leaving a gross profit of £48,288 (£39,830). After meeting capital charges there was a net profit of £34,539, as compared with £28,025 in the preceding year, of which £18,717 was contributed to debt redemption and £15,822 placed to reserve. The capital expenditure during the year, which included £52,569 for machinery and £12,771 for mains, amounted to £86,399. The sales of electrical energy increased from 7,835,309 to 9,478,876 kWh, and the maximum supply demanded from 5,150 to 6,580 kW. The capacity of the power station was increased to 13,000 kW during the year by the addition of a 5,000-kW turbo-alternator, and nine miles of l.p. and five miles of h.p. mains were laid. A bulk supply to Felixstowe was commenced in November last.

Kirkcaldy.—YEAR'S WORKING.—The accounts of the burgh electricity undertaking (engineer, Mr. O. F. Francis) for the year ended May 15th last, record a total income of £48,895 and working expenditure of £28,297, leaving a gross profit of £20,598. The figures for the previous year were: Income, £43,650; working expenses, £26,089; gross profit, £17,561. After meeting capital charges, &c., there was a net profit of £3,589, as compared with £812 in 1924-25. The capital expenditure during the year amounted to £9,459. The sales of electrical energy rose from 6,076,063 to 7,050,533 kWh, and the maximum supply demanded from 2,600 to 3,080 kW. The average price per kWh obtained fell from 1.716d. to 1.658d.

Leyton.—LOAN SANCTIONED.—The Urban District Council has received sanction to a loan of £19,500 for converting plant and switchgear.

Manchester.—PROGRESS DURING MAY.—During the month of May the Corporation electricity undertaking showed an increase in connections of 1,808 kW, bringing the total to 285,686 kW; and the number of applications received for supply, including consumers for additional supplies, was 626, representing a total of 1,670 kW. The number of hired cookers connected increased by 95, bringing the total actually on circuit to 1,707. Applications for the hire of cookers totalled 83. A 750-kVA transformer was put into commission at McConnel's Mill sub-station in place of one of 500 kVA.

Northern Ireland.—ARMAGH.—An inquiry was held on June 24th and 25th, by Messrs. G. H. E. Parr and W. Abbott, for the Electricity Commissioners, into the application of the Urban District Council for sanction to a loan of £12,500 in connection with the proposed electricity scheme. For the Council it was stated that the revenue for the first year was estimated at £3,425; second year, £4,803; and third year, £6,112. The charges would be 9d. per kWh for private lighting, 4d. per kWh for power, and 3d. for public lighting. The scheme was opposed by the ratepayers on the ground that it would be a burden on the rates, and it was also opposed by the local gas company. The Commissioners' decision will be given in due course.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

GLOUCESTER:—Lighting: First 500 kWh per quarter, 6d. per kWh; next 1,000 kWh, 5d.; next 8,500 kWh, 4d.; beyond, 2d.

DUBLIN:—Lighting: A reduction of 1d. per kWh.

KINGSTOWN (Co. DUBLIN).—Lighting: From 10d. to 8d. per kWh.

CHESTERFIELD.—The basic charge to large power consumers of £6 per kVA of maximum demand and .4d. per kWh, reduced to £5 10s. and .375d. respectively, with the existing discounts.

MAIDENHEAD.—Lighting: From 6½d. to 6d. per kWh. Power and heating: From 2d. to 1½d. per kWh.

Scarborough.—PURCHASE OF UNDERTAKING.—The Town Council on July 5th decided to make application for sanction to a loan for the purchase of the electricity supply undertaking. The cost of the purchase is £165,994, plus the stores, &c., in possession of the company.

Sheffield.—ELECTRICITY SUPPLY.—During the past month the Electric Supply Committee has approved extensions and works amounting to £4,175, and extensions of mains for general distribution purposes amounting to £9,431.

Southport.—YEAR'S WORKING.—The report on the working of the Corporation's electricity undertaking (engineer, Mr. E. Moxon) for the year ended March 31st last, shows a total revenue of £91,518, as compared with £89,339. Working expenses increased from £42,550 to £46,570, and there was a gross profit of £44,948, as against £46,789. After providing for capital charges there was a net surplus of £17,104, as compared with £18,655 in 1924-25. A contribution of £2,820 was made

to the borough fund. The capital expenditure during the year amounted to £43,162, and included £17,700 for mains and services. The sales of electrical energy increased from 6,018,541 to 7,079,539 kWh. Application has been made for sanction to install an additional 6,000-kW turbo-generator, in order to meet the demands for the winter of 1927, and the request of the Birkdale District Electricity Supply Co., for additional bulk supplies.

Special Orders.—Applications have been made to the Electricity Commissioners for Special Orders by the following authorities:—The Milford Haven Urban District Council for permission to supply electricity in the urban district; Messrs. E. H. Leach and W. H. Phillips, to supply to the borough of Tenby; the Sutton Coldfield Corporation in the parishes of Great Barr and Shenstone; and the Warmley Rural District Council to supply in the rural district.

The Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising the Shropshire, Worcestershire and Staffordshire Electric Power Co. to supply electricity in the urban districts of Marston Sicca and Pebworth, and parts of the rural districts of Stow-on-the-Wold, the rural districts of Marston Sicca and Pebworth, and parts of the rural districts of Tewkesbury, Winchcomb Campden, Stow-on-the-Wold, Alcester, Stratford-on-Avon, and Brailes; the County of London Electric Supply Co., Ltd., in the parish of Merstham; and the Gwynedd Trust, Ltd., in the urban and rural districts of Whitchurch and Ellesmere, and the rural district of Malpas.

The Minister of Transport has confirmed Special Orders covering the following areas:—Wallingford and District, and Tunbridge Wells and Tonbridge (bulk supply).

Wimbledon.—LOANS.—The Electricity Committee has decided to seek sanction to loans of £100,000 for mains, services and transformer sub-stations, and £5,000 for the wiring of premises.

Worcester.—YEAR'S WORKING.—The accounts of the city electricity undertaking (engineer, Mr. C. M. Shaw) for the year ended March 31st last show a total income of £59,942, as compared with £58,006 in the preceding year. Working expenses totalled £34,131, as against £32,209, leaving a gross profit of £25,811 (£25,707). After deducting capital charges there was a net profit of £7,610, as compared with £7,581 in 1924-25, against which works of capital nature amounting to £2,693 were charged, leaving a balance carried forward of £4,917. The electrical energy sold increased from 6,942,757 to 8,182,820 kWh, and the maximum supply demanded from 4,443 to 5,447 kW. The average price per kWh obtained fell from 1.91d. to 1.66d.

Tramway and Railway Notes.

Australia.—BRISBANE (Q.).—We have received from Mr. G. R. Steer, general manager of the City Council's tramway undertaking, a copy of his report, together with the statement of accounts for the year ended December 31st last. The total revenue amounted to £706,520, as compared with £663,747 in 1924. Working expenses were £563,604, as against £536,989, leaving a gross profit of £142,916 (£126,758). After providing for interest (£80,514), sinking fund (£15,358), depreciation (£59,439), and amortisation account (£14,000), there was a debit balance for the year of £26,395. The accounts issued by the Brisbane Tramway Trust for the years 1923 and 1924, showed a profit of £11,073. The accounts for the two years could not be separated at the time because 17 months elapsed before a settlement was effected with the company, but there was really a loss in 1924, after providing for all the capital charges. The number of passengers carried increased from 78,367,194 to 82,514,979, and the car miles run from 5,457,800 to 5,915,841. The net revenue per car mile rose from 5.57d. to 5.80d.

Bradford.—RAILLESS CARS.—A trial trip over the new railless-car routes between Bradford and Clayton, provided by the Corporation Tramways Department, in conjunction with the Clayton Urban District Council, took place on July 8th. The service will be in operation early in August.

Chesterfield.—RAILLESS CARS.—The Town Council is recommended by the Tramways Committee to apply for sanction to a loan of £27,947 for a railless-car scheme, including the purchase of 14 vehicles.

Continental.—FRANCE.—A new section of the Paris underground electric railway—between the Palais Royal and the Pont Marie—has recently been completed and opened for traffic. The section has a length of 1¼ miles, and has three stations.

SWITZERLAND.—Delegates of the Cantonal authorities of Berne, Lucerne, and Basle, recently waited on the Swiss Federal Railway authorities to urge that the electrification of the Basle-Delsberg, Delsberg-Delle, and Lucerne-Langnau-Berne sections of the railway system should be included in the 1928 programme. The railway authorities, while agreeing to give the matter consideration, stated that no guarantee could be given as to the inclusion of the work in the 1928 programme.

ITALY.—The Naples Railway Co. has been authorised by the Italian Government to electrify its railway system. In addition, the Government has extended the concession until 1976, and has agreed to pay a subsidy in respect of the line.

Ipswich.—YEAR'S WORKING.—The accounts of the Corporation tramway undertaking (manager, Mr. A. S. Black) for the year ended March 31st last, record a total revenue of £35,991, as compared with £37,692 in the previous year. Working expenses were £29,020, as against £32,084, leaving a gross profit of £6,972 (£5,608). The railless-car system recorded a total revenue of £6,159, as against £4,084, and working expenditure of £5,448 (£3,245), leaving a gross surplus of £710 (£839), which was carried to net revenue account with the surplus from the tramway system, making a total of £7,682. After providing for capital and other charges, a balance of £3,937 was carried to appropriation account. Debt redemption, contribution to capital outlay, and special expenditure accounted for £5,088, leaving a deficit for the year of £1,151, which was charged against a balance of £3,858 brought forward from the previous year, leaving a balance of £2,708, which was carried forward. The number of passengers carried increased from 5,922,474 (railless cars 939,109) to 6,186,119 (railless cars 1,350,458), and the car miles run from 582,729 (railless cars 61,698) to 609,053 (railless cars 115,830). The revenue per car mile fell from 17.206d. to 16.609d.

Kirkcaldy.—YEAR'S WORKING.—The report on the working of the Burgh tramway undertaking (manager, Mr. O. F. Francis) for the year ended May 15th last, shows a total revenue of £34,724, as compared with £35,167 in the preceding year. Working expenses increased from £24,595 to £24,979, leaving a gross surplus of £9,745. Interest, sinking fund, and other charges absorbed £6,421, and there was a net surplus of £3,324, as compared with £4,116 in 1924-25. The number of passengers carried decreased from 5,543,456 to 5,491,846, and the car miles run from 426,790 to 419,914. The revenue per car mile rose from 19.776d. to 19.846d.

Liverpool.—YEAR'S WORKING.—We have received from Mr. P. Priestley, general manager of the Corporation tramway undertaking, a copy of his report, together with the accounts of the undertaking for the year ended March 31st. The total revenue amounted to £1,434,597, and working expenses were £1,154,183, leaving a gross profit of £280,414. The figures for the previous year were:—Income, £1,360,767; working expenses, £1,144,062; gross profit £216,704. Interest and sinking fund charges absorbed £102,268, and there was a net surplus of £178,146, as compared with £119,111 in 1924-25; this was divided as follows:—Contribution to city rate, £50,000; transferred to reserve renewal and depreciation fund, £128,146. The capital expenditure during the year amounted to £165,861, the chief items being £90,800 for land, buildings, and fixtures, £53,253 for cars, and £11,833 for permanent way reconstruction. The total capital now expended on the undertaking stands at £2,840,068. The number of passengers carried increased from 234,906,356 to 247,168,008, and the car miles run from 16,789,321 to 17,368,887. The receipts per car mile increased from 18.899d. to 19.123d. During the year 24 new cars were put into commission and about 22 miles of trolley wire was renewed. Powers have been obtained for the construction of five new tramways, and work is well in hand on the Mill Street section.

London.—THROUGH-RUNNING.—The London County Council has decided that the agreement entered into with the Croydon Corporation for the through running of cars between London and Purley for a period of six months ending August 6th, be extended until September 30th next.

L.C.C. TRAMWAYS.—The report of the Highways Committee of the London County Council upon the working of the tramways during the year ended March 31st, 1926, shows that the revenue was £4,262,700 and the working expenses were £3,946,221. The gross surplus, after charging war service allowances, was £261,060. After meeting capital charges, including £196,019 for debt interest and redemption, there was a net deficiency of £114,629, against £278,441 in 1924-25. Relief to the extent of about £300,000 was obtained from the suspension of repayment of 25-year loans, sanctioned by the Treasury, upon the Council's representation that the life of the assets representing the loans was greater than 25 years. The estimated saving to road authorities in consequence of the obligation of the Council to maintain the paving along the tramway routes was £235,000 in the year under review.

Manchester.—YEAR'S WORKING.—The report on the working of the Corporation tramway undertaking (manager, Mr. H. Mattinson) for the year ended March 31st last, records a total revenue of £1,787,711, as compared with £1,812,739. The decrease is attributed to the revision of fares and stages which took effect in December, 1924. The working expenditure increased from £1,302,398 to £1,395,192, leaving a gross profit of £392,519 (£510,341), to which was added interest on investments (£19,971), a surplus from the Parcels Department (£6,811), and a grant from the Unemployment Grants Committee (£2,873), making a total of £422,174. Against this, however, the following charges had to be met: Deficit on the motor-omnibus system, £184; interest, £95,394; debt redemption, £151,922; street improvements, £8,862; rent of tramways, £37,929; and income tax, £47,273. The net result, therefore, was a surplus of £116,608, which was transferred to renewals account. The previous year's working resulted in a surplus of £242,499. The capital expenditure during the year amounted to £359,368, the chief items being rolling stock, £170,218, and permanent way, £102,454. The number of passengers carried increased from 305,086,307 to 317,644,753, and the car miles run from 21,190,557 to 22,567,759. The total revenue per car mile fell from 20.531d. to 19.012d.

United States.—NEW YORK.—A strike commenced on July 8th on the subway and elevated electric railways of the Interborough Rapid Transit Co., owing to the refusal of the men's demand for an increase of wages to $1 per hour. About 700 employés were affected at first, but a later *Reuter* message states that one-third of the power-house attendants ceased work on July 10th. According to the company, these men have been replaced, and a supply of electricity is being maintained.

Telegraph and Telephone Notes.

Canada.—TELEPHONE SERVICE.—There are now in Canada 13.1 telephones to every 100 inhabitants. The total number of telephones in operation in the Dominion at the end of last December was 1,148,770.

China.—AUTOMATIC TELEPHONY.—According to *Commerce Reports*, plans have been made by the Communication Department of the Kwantug Government (Japanese) for the installation of automatic telephones in the Japanese settlements in Mukden and Changchun. The estimated cost is 1,800,000 yen, and the work will not be completed until 1931.

Fernando Po.—WIRELESS TELEGRAPHY.—Communication by wireless telegraphy between Spain and Fernando Po is to be established.—*Reuter's Trade Service* (Madrid).

Hull.—YEAR'S PROFIT.—The Corporation of Hull, the only authority which owns a municipal telephone service in this county, reports a profit for the past year of £11,400.

NEW EXCHANGE.—By pressing a button in the Guildhall on July 7th, the Lord Mayor, Mr. Frank Finn, released an electrically-controlled bolt which opened the new automatic telephone exchange in another part of the city.

New Telegraph Cable.—ATLANTIC SECTION.—The laying of the first section of the new "permalloy" Atlantic cable for the Western Union Telegraph Co. between Bay Roberts, Newfoundland, and Penzance, Cornwall, was successfully completed on July 9th by the cable ship *Colonia*, which proceeded to London, where she will load the cable for the Bay Roberts and New York section.

The Telephone Service. — GROWING DOMESTIC USE. — Interesting facts are revealed in the official statistics of the telephone service for the past financial year. One is that during the year more residence rate subscribers were added to the system than business subscribers, the actual numbers being 39,355 residence-rate and 35,270 business-rate installations. Additions to the system during the two winter quarters (30,870 for the October-December quarter and 32,245 for the January-March quarter) were in turn the highest figures for any quarter. During the year there was a gross increase of 222,494 telephones, counterbalanced by 106,141 cessations, a net growth of 116,353. London showed an increase of 39,111 telephones, a growth of 8.7 per cent. England and Wales (excluding London) increased by 67,541, or 9.9 per cent.; Scotland's increase was 8,359, or 6.8 per cent.; and Northern Ireland, with a growth of 1,392 telephones, showed a 7.9 per cent. increase.

RURAL EXCHANGES.—There were 210 new rural exchanges, making a total of 882 since the inception of the rural development scheme in 1922; a further 60 exchanges were in course of completion. The number of rural railway stations connected with telephone exchanges at the end of March was 680, representing 762 telephone stations, and showing an increase for the year of 70 circuits.

Radio Notes.

France.—GOVERNMENT CONTROL.—It is reported that the French Government has decided to place the radio broadcasting service under Government control.

Irish Free State.—NEW STATIONS.—Mr. J. J. Walsh, the Irish Free State Minister of Posts and Telegraphs, has announced that the Government proposes to build a high-power station in the Midlands of the Free State, and three smaller stations at Cork, Galway, and Bundoran, County Donegal. Thus, with the Dublin station, there will be five stations in the 26 counties. It is estimated that the four new stations will cost £29,000, that the smaller ones will be completed during the next 12 months, and the high-power station within two years.

Licences.—PROSECUTIONS.—Sir W. Mitchell-Thomson, Postmaster-General, replying to a question in the House of Commons, said the number of persons prosecuted for the use of unlicensed wireless apparatus since the passage of the Wireless Telegraphy (Explanation) Act last autumn was 296. Hitherto it had not been necessary to prosecute any person more than once. The maximum penalty imposed was £10, in addition to £10 costs.

Sweden.—NEW HIGH-POWER STATION.—With regard to the Swedish Telegraph Office report that a contract has been concluded with Marconi's Wireless Telegraph Co., of London, for the delivery of equipment for a high-power broadcasting station at Motala, it is understood that, whilst it will be a modernised copy of the Daventry station, greater power will be employed; at first 30 kW antenna power will be used, with facilities for it being raised to 50 kW later.

The B.B. Co.—ANNUAL MEETING.—Lord Gainford (chairman), who presided at the annual general meeting of the British Broadcasting Co., Ltd., on July 8th, moved the adoption of the report, and said that the supplementary licence extending the Company's existence to December next restricted the amount to be paid to the Company from licences to £500,000. Owing to that restriction, they felt their activities and quality of service last year had been unfortunately prejudiced. He understood that the Government had accepted the Broadcasting Committee's report, and was preparing legislation to give effect to it. He wished to direct attention to certain points which would arise on the broadcasting service being taken over by any new authority. First, they had always maintained that the money collected from the public for the service should be devoted to the service, and not alienated, or diverted to any other purpose. Further, they represented on behalf of any new authority that they should have a claim on all money in the hands of the Government at the end of that Company's licence in order that they might proceed with development schemes immediately. In that connection, in addition to capital assets costing approximately £315,000, which would be transferred free, they estimated that (assuming the increase of licence issues be maintained) the Government would have in hand a sum of at least £900,000. The second point was that restrictions other than financial which had hampered them in the past should in the future be considerably eased. Thirdly, they trusted that the rearrangement of the system of distribution, namely, by regional high-power stations with alternative wave-lengths, would be put in hand at the conclusion of the present Daventry experiments. Sir William Bull seconded, and the adoption of the report was carried unanimously. The retiring directors were re-elected. A resolution was moved by Col. Ball, on behalf of the Burndept Wireless Co., and seconded by the Brownie Wireless Co., urging the directors to get into immediate touch with the Government with a view to getting a definite decision on the future of the broadcasting service. The resolution asked that the Government should at once bring in legislation so that the industry could know where it stood, or else to guarantee the *status quo* for at least twelve months. Other speakers supported the resolution, and it was carried unanimously. Lord Gainford undertook to convey to the Postmaster-General the sense of the resolution and to hand him a *verbatim* report of the proceedings at the meeting.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—MELBOURNE.—August 23rd. Electricity Commission of Victoria. 10-in. disk suspension insulators. (July 2nd.)

July 26th. 22,000-V porcelain bushing insulators. (July 9th.)

September 1st. Victorian Government Railways. Automatic sub-station equipment for Elwood sub-station. (B.X. 2598.)*

August 11th. City Council. H. and l.p. 3-phase sub-station switchgear.*

August 3rd. Postmaster-General's Department. Telephones and dials.*

August 10th. Telephone exchange indicators. (B.X. 2597.)*

August 31st. Telegraph equipment. (B.X. 2653.)*

September 21st. Switchboard keys and parts. (B.X. 2669.)*

BRISBANE.—August 26th. City Electric Light Co., Ltd. One 12,500-kW turbo-alternator.*

Belfast.—July 31st. Electricity Department. One 15,625-kW turbo-alternator with condensing plant and auxiliaries, or, alternatively, one 18,750-kW turbo-alternator with condensing plant and auxiliaries. (July 2nd.)

Bridlington.—August 6th. Electricity Works. One 600-kW surface condenser with extraction plant and circulating pump, pipework, and valves. One wooden cooling tower, with tank and foundations. (See this issue.)

Cleckheaton.—July 19th. Installation of electric lighting at "Nook" Independent Methodist Church and school. Particulars from Mr. G. W. Hayes, 44, Northgate, Cleckheaton.

Dover.—July 19th. Electricity Department. Voltage regulator. (July 2nd.)

Egypt.—CAIRO.—October 15th. Ministry of the Interior. Installation of electric power station equipment at Keneh and Luxor. (B.X. 2627.)*

August 2nd. Director-General, Mechanical Department. P.W.M., Cairo. 400-b.h.p. Diesel engine, driving an air compressor, together with auxiliary machinery.

India.—August 9th. India Store Department. Electrical generating plant for the Peshawar power station of the North-Western Railway. (B.X. 2644.)*

Kilkeel.—August 5th. Rural District Council. Cold-starting crude oil engine, generator, booster and switchboard, storage battery, pole erection work, line erection work, erection of power house. (July 9th.)

London.—BETHNAL GREEN.—July 29th. Board of Guardians. Installation of an internal telephone system at the Children's Homes, High Road, Leytonstone. Forms of tender (£2 2s.) from Mr. C. Faulkner Jones, clerk to Guardians, Bishop's Road, London, E.2.
H.M. Office of Works. July 28th. Wire and cable. (See this issue.)

Manchester.—July 26th. Electricity Committee. One 500-kVA static transformer. (July 9th.)
August 4th. 12 months' supply of electric cooking ranges. (See this issue.)

Newcastle-under-Lyme.—July 20th. Electricity Department. 1,000 yd. single l.p. feeder main, 1,000 yd. single l.p. armoured distribution main. (July 9th.)

New Zealand.—CHRISTCHURCH.—October 19th. Christchurch Drainage Board. Three sets of electric centrifugal pumping plant. (A.X. 3215.)*
WELLINGTON.—August 24th. Public Works Department. Synchronous condensers for the Waikaremoana electric power scheme. (B.X. 2608.)*
July 20th. Phase transformer for Mangahao electric power scheme.*
August 30th. 400-V, 3-phase, slip-ring induction motors and starters.*
September 28th. Three electrically-driven low-lift pumps, with control apparatus, for the Taleri drainage. (A.X. 3274.)*
November 2nd. Electric generators and turbines for Waikaremoana electric power scheme. (B.X. 2622.)*
Indoor control gear and switchgear in connection with the Waikaremoana electric power scheme. (B.X. 2675.)*
September 7th. Synchronous condenser for the Arapuni electric power scheme. (B.X. 2654.)*
August 10th. Postmaster-General's Department. Dry cells. (B.X. 2649.)*
DUNEDIN.—September 8th. City Council. One reaction waterwheel, with governor and valves, &c., one 3,000-kW generator, four 1,000-kW transformers, switchboards, oil-break switches, voltmeters, &c. (B.X. 2676.)*

Rochdale.—Board of Guardians. Supply of electric cables, fire bells, &c. Form of tender from Mr. I. Clegg, clerk to the Guardians, Union Offices, Townhead.

Saffron Walden.—July 24th. Borough Council. Engine and dynamo, switchgear, booster balancer and battery, accumulator battery, and mains. (July 2nd.)

South Africa.—August 12th. South African Railways and Harbours. Electric cables and wires and bare copper wire (for 12 months). (B.X. 2639.)*
Installation of electro-pneumatic power working of points and day-colour light signalling, with a.c. track circuits. (See this issue.)
August 26th. Material for the distribution system, Capetown suburban electrification. (B.X. 2680.)*
JOHANNESBURG.—July 29th. Municipal Council. Transformers. (B.X. 2636.)*
August 18th. Overhead tramway equipment. (B.X. 2702.)*

Spalding.—July 29th. U.D.C. Mains and kiosks. (July 9th.)

Warrington. — July 20th. Electricity Department. Twelve months' supply of e.h.p. and l.p. paper-insulated and lead-covered cables. (July 2nd.)

Waterford.—July 29th. Borough Council. E.h.p. overhead lines distribution network and street-lighting system. (July 2nd.)

Wolverhampton.—July 24th. West Midlands Joint Electricity Authority. Three steam boilers, pulverised fuel plant, ash- and coal-handling plant and boiler-house auxiliaries, for Birchills power station. (June 25th.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Birkenhead.—Electricity Committee. Accepted:—
200-kVA transformer (£203).—English Electric Co., Ltd.
H.p. switchgear (£219), l.p. switchgear (£265).—Metropolitan-Vickers Electrical Co., Ltd.

Bradford.—Baths Committee. Accepted:—
Electrical installations: Manningham baths (£117), Leeds Road baths (£113), Undercliffe baths (£117).—J. Carter.

Tramways Committee. Accepted:—
Electric motors, controllers, &c., for new saloon tramcar under construction (£483).—English Electric Co., Ltd.

Mental Deficiency Committee. Accepted:—
Electric lighting works at Ashfield Institution (£136).—W. J. Carter.

Chesterfield.—Tramways Committee. Accepted:—
Conversion of the overhead equipment, new turning circles, &c., and the supply of 14 single-decker Straker-Clough trolley vehicles for the railless system (£23,947).—Clough, Smith & Co., Ltd.

Dundee.—Housing Sub-Committee. Recommended:—
Electric lighting work at Craigiebank housing scheme (£282).—M. Hutton and Co.

Glasgow.—Watching and Lighting Committee. Recommended:—
Electric lighting of Langside and Kingston Halls (£155).—W. Draper and Co.

Corporation.
Electrical installations at Wellmeadow and Cathcart housing schemes (£873 and £407).—R. J. McIntyre. (Recommended.)
Two electric fans, &c., at McLellan Galleries (£172).—J. Cormack and Sons, Ltd. (Accepted.)
Alterations, &c., to electrical fittings, Partick Burgh Hall (£123).—W. Draper & Co.

Lamp Contract.—The Edison Swan Electric Co., Ltd., has received a contract for electric lamps from the Royal Mail Steam Packet Co.

Leeds.—Tramways Committee. Accepted:—
Tramway track reconstruction in Princes Avenue (schedule prices).—David Speight & Son.
Points and crossings (£1,146).—Edgar Allen & Co., Ltd.
Conversion of impregnating plant from steam to electricity (£240).—A. G. Brown.
50-h.p. d.c. motor (£130).—Flather & Co., Ltd.

Electricity Committee. Accepted:—
Cables.—W. T. Henley's Telegraph Works Co., Ltd. (£5,281); Enfield Cable Co., Ltd. (£4,023); Macintosh Cable Co., Ltd. (£3,514).
Kiosks (£480).—Park Royal Engineering Co., Ltd.
Truck switchgear.—Ferguson, Pailin, Ltd. (£539); Park Royal Engineering Co., Ltd. (£539)

Sewage Committee. Accepted:—
Electrical driving gear at Thorpe Stapleton sewage works (£210).—Hartley, Sons & Co.

London.—LONDON COUNTY COUNCIL.—Highways Committee. Switchgear for the works transformers at the Greenwich power station:—

Johnson & Phillips, Ltd. (Accepted.)	**£3,387**
General Electric Co., Ltd.	4,039
Metropolitan-Vickers Electrical Co., Ltd.	4,487
Ferguson, Pailin, Ltd.	4,667
British Thomson-Houston Co., Ltd.	4,912

The estimate of the general manager of tramways comparable with the tenders is £3,840.

ST. MARYLEBONE.—Electricity Supply Committee. Recommended:—
One 30-ton crane, one 15-ton do., alterations to 10-ton crane (£580).—Herbert Morris, Ltd.
Steelwork for gantries at Rathbone Place sub-station (£265).—Drew-Bear Perks & Co., Ltd.
Signalling equipment for engine room (£527).—Siemens Bros. & Co., Ltd.

Lurgan.—Urban District Council. Accepted:—
Plant in connection with electric lighting scheme.—Engines: Browett, Lindley & Co., Ltd. Motor-driven pumps (£415): Swinson's Engineering Co. Switchboards (£303): Curran Bros. Cables (£2,313): F. Reid, Ferens & Co. (Fifty-three tenders were received.)

Manchester.—Education Committee. Accepted:—
Electric lighting installation at Cheetham clinic.—Harrisons, Ltd.; at 1458, Ashton Old Road: E. Sudlow & Co., Ltd.

Central Purchasing Committee. Accepted:—
Electric lamps.—P. A'dair, Ltd.; W. E. Beardsall & Co., Ltd.; Berry's Electric, Ltd.; Drake & Gorham, Ltd.; Hirst, Ibbetson & Taylor, Ltd.; R. O'Brien; F. G. Ride & Co.; Sloan Electrical Co., Ltd.; Underwood (Manchester), Ltd.; J. C. White; "Z" Electric Lamp and Supplies, Ltd.; Leeds Flint Glass Co.; Stella Lamp Co., Ltd.

Electricity Committee. Accepted:—
Cables for 12 months.—Standard Telephones & Cables, Ltd.; W. T. Glover and Co., Ltd.; Johnson & Phillips, Ltd.; Macintosh Cable Co., Ltd.; Pirelli-General Cable Works, Ltd.; Hackbridge Cable Co., Ltd.; Callender's Cable & Construction Co., Ltd.; British Insulated Cables, Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Ward & Goldstone, Ltd.; Greengate & Irwell Rubber Co., Ltd.

Oldham.—Electricity Committee. Accepted:—
E.h.p. and l.p. switchgear.—Ferguson, Pailin, Ltd.
Economisers, steel castings, soot-blowers, &c.—E. Green & Sons, Ltd.

St. Helens (Isle of Wight).—Isle of Wight Electric Light and Power Co., Ltd. Accepted:—
Time switches.—Venner Time Switches, Ltd.

Sheffield.—Electricity Committee. Accepted:—
Automatic traction sub-station equipment, comprising two 750-kW converters, &c. (£7,510).—English Electric Co., Ltd.

Health Committee. Accepted:—
Electric lighting installation at Hillsborough baths (£196).—Oliver Bros.

South Shields.—Electricity Committee. Accepted:—
Two switch panels and apparatus (£362).—Metropolitan-Vickers Electrical Co., Ltd.

Stockport.—Town Council. Accepted:—
E.h.p. feeder switchgear (£8,090).—English Electric Co., Ltd.

Torquay.—Town Council. Accepted:—
Mechanical screening plant for the Newton Abbot power station (£3,212).—Brackett & Co., Ltd.

Wimbledon.—Electricity Committee. Recommended:—
New trunk main electric generating station and Raynes Park sub-station (£8,629).—Siemens Bros. & Co., Ltd.

Winchester.—Town Council. Accepted:—
Supply of electricity meters for 12 months.—Chamberlain & Hookham, Ltd.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We have to thank Mr. C. L. TOMLINSON (who did not enclose his address) for information regarding an electric iron.

Notes.

Where Every Ampère Counts.—The following quotation from a letter recently addressed to its patrons by the Electric Light Association of Wales, North Dakota, U.S.A., is somewhat amusing, having regard to the much-lauded development of electricity in the United States:—"Regarding electric power on Tuesdays—the plant will put out only 20 amperes. An iron pulls about five amperes and a motor for washing about two amperes. The plant will thus handle only four irons at one time. There are eight who have them and the four to use it in the morning are: Mrs. Geo. H. Johnson, Mrs. Geo. Lachner, Mrs. J. Levin and Mrs. Platz. The four in the afternoon are: Mrs. Fischer, Mrs. Fraser, Mrs. Nelson, and Mrs. Wareburg. If any others want to use power at this time they will have to see the engineer. It is for your own good to observe these rules. If more go on than the plant will handle, you will not get the power you want, and besides, you might hurt the engine by overloading." It is probable that this station is maintained to enable America to claim to have the smallest, as well as the largest, undertaking.

L.C.C. Tramways and Motor 'Bus Competition.—The General Purposes Committee of the London County Council has had under consideration the report of the London and Home Counties Traffic Advisory Committee as to the steps taken to reduce unnecessary and uneconomic omnibus competition with tramway undertakings in the Metropolitan Police District, and has ascertained the views of the Highways Committee on the report. As a result it is recommended that the Council should inform the Ministry of Transport that the reductions so far proposed during rush hours in the number of omnibus journeys along tramway routes are less than is justified by the accommodation available in tramcars, and the loading obtained; that reductions should be made in slack-hour services for omnibuses in the same proportion as obtains for tramways; that in connection with the reduction of omnibus services, direct regard should be had to the number of omnibus journeys worked not later than on April 1st, 1923; and that restriction in the number of omnibus services should be applied to Sunday services.

A Rail Testing Device.—According to the *Railway Review*, a special device for testing rails has just been invented by M. Suzuki, of the research institute of the Japanese Government Railways. The new invention applies the principle of electric resistance, and records variations on a moving roll of paper. As the machine runs along the rail with the current passing through it, it will, if there are no defects in the rail, inscribe a straight line. Cavities in the rail, since they cause higher resistance, will be indicated by irregularity in the lines made by the device. The Government contemplates employing several of these appliances on extensive tests on the railways of Japan.

Wireless for Mountaineers.—In view of the difficulty of fitting refuge huts for mountaineers with the telephone, experiments have been carried out during the past three years with wireless. The Radio Club de France has now decided to equip some of the more generally frequented refuges with transmitting as well as receiving sets, those mentioned being La Charmette, in the Chartreuse; Blonay-Dufour, on the Tournette; Wallon, Oredon in the Pyrenees; Cerbier-des-Joncs; Aberouat and Arvieres. The decision presents greater difficulties than are at first apparent; specially resistant apparatus has to be constructed, which, at the same time, is sufficiently light to be transported on the backs of men, no animals being able to reach the heights where the refuges are situated.—*Reuter* (Paris).

Swiss Electric Locomotives.—Tourists to Switzerland this summer who use the Berne-Loetschberg-Simplon railway line will travel behind what are probably the biggest electric locomotives in the world, running on a single-phase system. The company has recently ordered two new machines which will be 68 per cent. more powerful than those already running. They will be specially useful on the Frutigen-Kandersteg section, where, for the whole of the length, the grade is 27 per cent. Each engine is to be capable of drawing a train of 500 tons (engine not included) at a speed of 50 km. per hour, while its maximum speed is to be 75 km. per hour. The maximum weight per running metre is to be seven tons, and the pressure at motor axle-tree nineteen tons. All the mechanical parts of these machines are being supplied by Messrs. Ernesto Breda, of Milan. They will each have eight bogies and six twin single-phase motors, furnishing 700 h.p. The power is to be transmitted from the motors to the bogies by the Secheron system, consisting of a hollow shaft and an elastic coupling between this and the motor wheels.

Electricity in Switzerland.—The Swiss Bank Corporation, in its June Bulletin, discusses the development of the production and use of electricity in Switzerland from the beginning of the industry until the present time. In 1914 the average output of electrical energy in the country was 526,000 h.p., while at present the stations in Switzerland have a maximum capacity of 1,850,000 h.p. Works are in course of construction which will give a further 280,000 h.p., and schemes are under consideration which would mean the addition of another million h.p. In 1913 the energy produced worked out at 0.23 h.p. per head of the population, and at the end of 1925 it had risen to 0.47 h.p. Of the total production in 1925, 46 per cent. was from private sources, while the remainder was produced by the State or public bodies, 11 per cent. being generated by the Federal Railways. There has been in recent years a large increase in the proportion of the total output accounted for by private enterprise. In 1916, when the Swiss Federal Railways still had no power stations of their own, private concerns were responsible for an output of 519 million kWh out of a total of 1,376 million, while in 1924 1,881 million kWh came from private sources out of a total of 3,465 million. The system of exporting electrical energy to neighbouring countries has in the recent years been the subject of much criticism in Switzerland since, in general, the wholesale price of energy sold abroad is lower than that paid by the ordinary Swiss consumer. The fact is that, after Switzerland's own requirements have been satisfied, there remains a certain balance of power which must be utilised, since home consumption does not increase in the same proportion as the power available, and the prohibition of exports would certainly hinder the development of Swiss electrical manufacturing concerns, and add to the risks and uncertainties which attend the opening-up of new installations. The revenue received from the sale of electricity outside the country rose from 6,300,000 francs in 1920 to 13,600,000 francs in 1925.

Incorporated Municipal Electrical Association.—MEMBERS OF COUNCIL.—The members elected to the Council of the I.M.E.A. as the result of its 1926 annual ballot are as follows:—*Representing large undertakings*: A. W. Barham (Watford), C. G. Morley New (Cardiff), Col. W. A. Vignoles (Grimsby), W. J. H. Wood (Bolton). *Representing small undertakings*: G. Porter (Worthing). *Committee representatives*: Alderman W. T. Dagnall (Manchester), Col. A. Sinclair (Swansea).

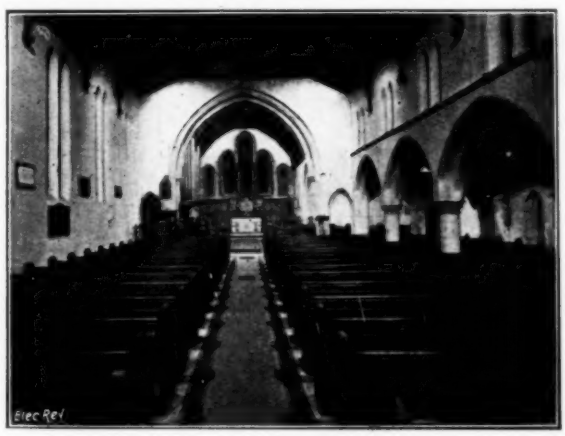
An Imitation Ocean.—It is not generally known that an artificial ocean played its part in the development of the Western Electric Co.'s "permalloy" loading material for submarine telegraph cables. An iron-nickel alloy tape is wrapped round the copper conductor to increase its inductance, and hence the efficiency of transmission. The new alloy has remarkable magnetic properties, which are quite sensitive to mechanical stress; in order to ascertain whether the customary methods of cable manufacture would be satisfactory, it was necessary to make sample lengths of cable and test them under deep-sea conditions, which are high pressure (somewhat more than a long ton per sq. in. at a depth of one statute mile) and low temperature (about 39 deg. F.).

To reproduce such conditions specially designed pipes were made to contain 20-ft. lengths of cable core and one pipe was made 50 ft. long; pressures up to 6,000 lb. per sq. in. are customary, and it was possible to maintain 10,000 lb. in one pipe, so it was thus possible to produce conditions similar to those obtaining more than four miles beneath the ocean. The temperature was regulated by jacketing the pipes with ice-cooled water. Then, according to the *T. and T. Age*, the first test conductors were made following as nearly as possible the standard cable practice of the time; the annealed, permalloy wrapped, copper conductors were coated with Chatterton's compound, just sufficient to cover the surface, before insulating with gutta percha, and inductance tests made at this stage in the manufacturing process showed that no serious mechanical stresses had been encountered during covering, but when the samples were inserted in the pipes and the pressure was allowed to increase slowly just as if the cable were sinking into the sea, the inductance of the samples began to decrease, and had fallen to only one-quarter of the desired amount before one mile depth had been reached. Evidently the old type of cable construction would not serve. The next test was to determine if the permalloy loading was really affected by the sea-water pressure, or if it was because the pressure was applied to the outside of the gutta percha only. An uncovered loaded conductor was tested under pressure, so that the water could penetrate under the permalloy loading, and the full sea pressure was applied equally to both sides of the tapes. The inductance was not noticeably effected up to the highest pressures, which showed that if the permalloy floated in a liquid medium, it would not be injured by deep-sea pressure. A solution of the problem was finally found by the development and proper application of a compound that remains quite fluid at low temperatures. After the permalloy tape is applied and heat treated, the whole conductor is vacuum impregnated and coated with this compound, before the application of the gutta-percha insulation. Now as the cable is subject to increasing pressure, the gutta-percha compresses (as in the earliest tests) but it is supported by the semi-fluid compound, which conveys the pressure effect to both sides of the permalloy loading, thus leaving it unstressed.

Canadian Oil Development.—In a paper entitled "Petroleum and Natural Gas Developments in Alberta," read before the annual general meeting of the Canadian Institute of Mining and Metallurgy by Mr. Charles C. Ross, he says that the results of the work have proved that structures located in the foothills are capable of producing exceptionally high-grade crudes in considerable volume, and with huge flows of natural gas. In the area known as the "Great Plains of Alberta" low-grade crudes and natural gas are also held in storage. In one well, the Royalite No. 4, described by many leading oil men as the "wonder well," which was spudded-in during September, 1922, the drill reached a depth of 2,890 ft. by the end of 1923, at which depth a flow of some 7,000,000 cu. ft. of wet gas per day was secured, while in October, 1924, there was a flow of wet gas measured at 21,500,000 cu. ft. per day at a depth of 3,740 ft. Since the installation of the Smith separators there has been an average production of 456 barrels of oil per day, the total for last year being 166,500 barrels.

Large Electric Furnaces.—Some particulars are given in the *Electrical News*, Toronto, of an installation of large metallic resistor electric furnaces which has been provided in Ontario, for the production of brass and copper, by the Canadian General Electric Company. Two 300-kW furnaces are working at 220 V on balanced 3-phase. The heat generating resistors are of nickel-chromium alloy and located in the top and bottom of the furnace. Thermal couples operate Leeds and Northrup controllers which actuate magnetically controlled contactors for maintaining the temperature at the thermal couple constant. The material for annealing is loaded on a steel pan which is drawn into the furnace by an electrically-operated winch. The pan is about 14 ft. long, 5 ft. wide, and weighs about 600 lb.; loads of metal weighing as much as 10,000 lb. are easily handled, and each furnace will deal with 125,000 lb. of metal in 24 hours. The working temperature is 1,250 deg. F.

Church Lighting.—The lighting of churches is always an interesting, if not always simple, proposition. The photograph which is reproduced below was taken at night to illustrate the interior of Cockfosters Church, Barnet, which is now illuminated electrically. Mr. E. W. Dorey, A.M.I.E.E., was responsible for the design of the installation, which is giving excellent results; the absence of any visible fittings indicates that a flood-lighting system has been employed, Benjamin industrial type elliptical angle fittings having been used, located well up in the roof.

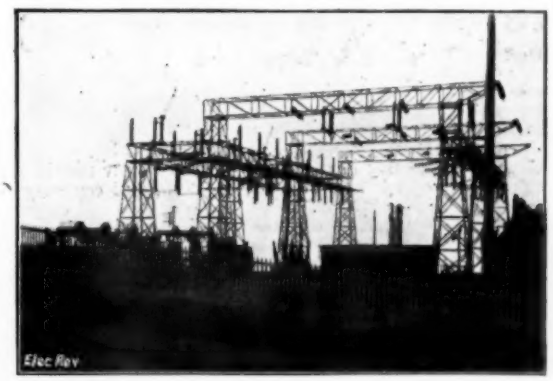


Cockfosters Church, Barnet.

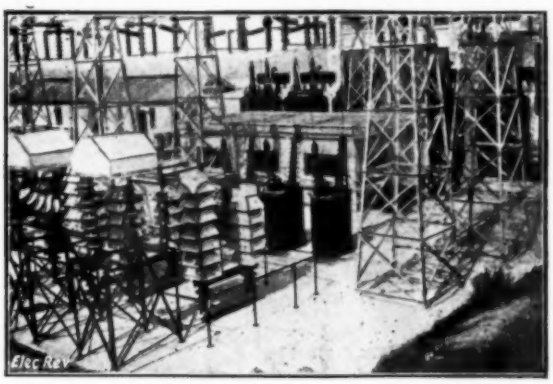
Appointments Vacant.—Full-time lecturer in electrical engineering (£276) for the Battersea Polytechnic; assistant mechanical and electrical engineer for Iraq (£250 +). (See our advertisement pages to-day.)

The British Association.—The preliminary "time-table" for the Oxford meeting (August 4th-11th) has been published by the British Association for the Advancement of Science. It is anticipated that 3,500 members and delegates will attend the meeting, but no anxiety is felt regarding accommodation. For the first time since the outbreak of war, German savants will take part in the conference. It is expected that the address of the President (the Prince of Wales) will deal with the relations of science and industry. The meeting places of the various sections are all within a small radius, making it possible for members interested in more than one subject to move easily from one meeting to another. Sir John Snell, the president of the Engineering Section, is to address that section on "The Present and Future Development of Electricity Supply." Other papers which are being read in the same section are "Some Engineering Problems in Connection with the Refrigerated Transport of Apples," by Dr. Ezer Griffiths, which is to be followed by a discussion on food transport and refrigeration; "The History of Magnetism and Electricity," by Prof. G. W. O. Howe; "The Distribution of Electrical Energy," by Mr. J. M. Kennedy; "Some Phenomena of Conduction," by Prof. W. Cramp; "The Recent Developments in Compression Ignition Engines," by Mr. D. R. Pye; "Influence of Voltage Harmonics on Power Factor," by Mr. E. Hughes; "The Distribution of Pressure in Impulse Steam Turbines at Varying Loads," by Mr. W. J. Kearton; and "The Classification of Patent Specifications," by Dr. A. P. Thurston. In Section A.—Mathematical and Physical Science, the following papers will be read, among others:—"Calculations of the Form and Electrostatic Energy of Crystals," by Prof. S. Chapman; "The Transference of Energy in Collisions between Electrons and Molecules," by Prof. J. S. Townsend; "On the Direction of Electrons emitted by the Photo-Electric and Compton Effect," and "On the Asymmetry and Intensity of Spectral Lines split in the Electric Field connected with the direction of impacts originating the emission of light," by Prof. W. Wien; and "The Gyro-Magnetic Electron," by Prof. Vessot-King. In addition to these, electricity enters in some degree into several papers which are to be read before other sections. A number of interesting subjects are to be discussed in Section F.—Economics, including one on "The Economic Aspects of the Labour Outlook," by Sir Lynden Macassey.

Outdoor Sub-Station in New Zealand.—The accompanying illustrations are reproductions of photographs for which we are indebted to Mr. W. G. Matthews-Sherman. They are views of the open-air step-down sub-station at Kanallah, Wellington, in New Zealand, to which brief reference was made on page 694 of our April 30th, 1926, issue. The general view of the sub-station, which reduces the transmission voltage from 110,000 V to 11,000 V, shows the link line switches at the extreme left of the overhead structure, whilst the other view indicates the relative positions of the lightning arresters on the left, the 3-phase oil-immersed switches in the centre, and the transformers in the right background.



An Outdoor Sub-Station in New Zealand.



Another View of the Kanallah Sub-Station.

Largest Steam Plant.—What, it is claimed, will be the largest steam plant in the world is to be erected in America by the Insull interests, in the Calumet industrial district, just across the Indiana State line, at a cost of $100,000,000 when fully completed. The first unit will be completed by 1929, and will cost $25,000,000. It will have a generating capacity of 200,000 kW, and will be three and a half times the capacity of the largest steam turbo-generators now in use. When all the units are completed the station capacity will be 1,000,000 kW. The station will be owned by a new corporation, says *Electric Traction*, to be known as the State Line Generating Company. It will be a producer and wholesaler of electricity, and its customers will be its stockholders, the Commonwealth Edison Company, the Public Service Company of Northern Illinois, the Northern Indiana Public Service Company, and the Northern Indiana Gas and Electric Company. A factor in the decision to locate the immense plant in the Calumet district was the limitless supply of condensing water provided by Lake Michigan.

Pulverised Coal in France.—A pulverised fuel-firing installation, which presents some interesting features, has recently been completed at the Labuissière electric power station connected with the Bruay coal mines in the Pas de Calais Department of France, some particulars of which were lately given by M. Michel Sohm, chief engineer of the Bruay Co., to the Société d'Encouragement pour l'Industrie Nationale. The boiler-house plant comprises two batteries, each consisting of sixteen boilers set in pairs, and each having a heating surface of approximately 2,088 sq. ft.; only one of the batteries is so far fired with pulverised fuel. The preparing plant is so located that the distance between the fuel storage receptacle and the hopper of the most distant boiler is not more than 131 yards, a distance through which the fuel is capable of easily being piped by means of compressed air. At present the plant is capable of delivering from 150 to 180 tons of pulverised fuel per day of 16 hours, but these figures will later be doubled in order to supply the full 32 boilers. The power necessary for the installation in full working order and for all operations is 15 kilowatt-hours per metric ton of pulverised fuel. Exhaustive tests have proved it possible to run the boilers continuously day and night for from 120 to 150 days. After that lapse of time the furnace bricks can, however, be scaled without any trace of alteration of the efficiency of the bricks themselves. The fact that two identical batteries of boilers have been working under one roof under similar load conditions, one fired with ordinary coal and the other with pulverised fuel, has enabled a record to be secured of the cost of steam raising by the two systems. When coal fired the sixteen boilers consumed 3,183 metric tons in 30 days at a total cost of 177,017 francs, and produced 12,571 metric tons of steam, equal to a coal consumption of 556 lb. at a cost of 14 francs 8 centimes per metric ton of steam. During the same period the second battery of sixteen boilers used 3,804 tons of pulverised fuel at a total cost of 192,446 francs, but produced 23,344 tons of steam; in other words, the cost per metric ton of steam was only 359 lb. of fuel and 8 francs 24 centimes in money. The advantage in favour of pulverised fuel is even greater than that shown above, as when the comparative tests were made the pulverised-fuel boilers were not fitted with economisers as are those fired with coal. When the saving derived from the use of economisers is taken into account it is estimated that pulverised fuel will show an economy of nearly 45 per cent. over ordinary coal firing.

Wireless Equipment of Spanish Aircraft.—Spain has devoted considerable attention to her aircraft services of recent years, and her military air service is particularly well equipped with wireless apparatus. Installations on aeroplanes cover a wide range of types, from two spark sets to 23 of the latest "AD6" sets of the type standardised on British civil aircraft. All are of Marconi design and manufacture, making a total of 82 aircraft wireless receiving and transmission sets. The Spanish air service also possesses 60 complete sets of accessories for the A.D.2 sets and, in addition, orders are now in hand for the delivery of 10 further A.D.6 sets, together with 25 sets of fittings for this type of installation. The Marconi direction finder has also been adopted by the Spanish authorities, twelve installations for flying machines being in use as well as five aerodrome installations. Ground transmitting and receiving sets of the ¼-kilowatt type are fitted at Melilla, Tetuan, Larache, Seville, Granada, and Los Alcazares aerodromes; the military aerodromes at Cuatro Vientos and Getafe, Madrid, are equipped with 1¼-kilowatt sets and amongst other equipment are 13 emergency landing sets and six testing sets for aerodrome wireless apparatus.

Frederick S. Spiers Memorial.—Many friends and associates of the late Mr. Frederick S. Spiers are desirous of establishing a memorial which will serve to remind future generations of the valuable services he gave to science and humanity, and which will provide an opportunity for those who knew him to express their personal appreciation of his work. It has been suggested that this should take the form of a memorial lecture to be paid for out of the interest on the fund and to be given at intervals, to be decided later, under the auspices of the Faraday Society. A committee to promote this appeal has been formed and a preliminary list of contributions totals £130. Contributions should be addressed to assistant hon. sec. (Miss M. Parsons), Faraday Society, 90, Great Russell Street, London, W.C.1.

Inventions Commission.—Mr. Justice Tomlin and Sir G. Chadwyck-Healey, sitting as members of the Royal Commission on Awards to Inventors, at the Law Courts, London, on July 8th, heard an application for approval of an agreement between the Metropolitan-Vickers Electrical Company, Limited, and the Lords Commissioners of the Admiralty in respect of wireless-telegraph patents. According to *The Times*, Mr. Whitehead, K.C., for the applicants, said the eight letters patent involved were not all subsisting now, but they were all subsisting at the date when the agreement was being negotiated. The one patent which he proposed to discuss was so important in a sense that the remaining seven were relatively insignificant. That patent existed, and would expire in 1929. It stood in the name of Lee and Hogan, and the present owners were the applicants. Lee and Hogan's discovery led to an invention which made continuous-wave reception a practical art, and it was still in use, but not limited in its application to continuous waves. The applicants became the owners of the patent in 1922.

The Admiralty, he said, had taken great care in the agreement to protect itself from every point of view. The agreement provided for the payment for past and future user of a sum of £4,000 down and £2,000 a year for each of the next three years. The agreement provided, among other things, that if before the time for the last payment the letters patent were held to be invalid by any competent Court the applicants should repay to the Admiralty the whole of the sums which they had received. Mr. Whitehead explained that the patent was not being used for the detection of speech, but simply for the reception of Morse signals.

Dr. Eccles, F.R.S., said there was nothing comparable in efficiency to this invention, and he ranked it as one of the most important of the three or four important discoveries made in wireless telegraphy.

Mr. Moritz said that on behalf of the Admiralty he had to state that they thought the lump sum arrived at was reasonable.

Mr. Justice Tomlin said the Commissioners were of the opinion that, with certain modifications, they could approve the agreement.

Electricity Supply in the Federated Malay States.—In our "Personal Column" we mention in connection with the retirement of Mr. J. C. M. Matthews, M.I.E.E., chief electrical engineer and inspector, Federated Malay States, that an 800-kW hydro-electric plant was the commencement of public supply in the F.M.S. At the present time Kuala Lumpur has 2,700 kW of plant installed, and a new station with 9,000 kW of plant is under construction. The rapid development of tin dredging round Kuala Lumpur will mean extensions to this station in the near future; provision is made in the design of the station to meet this. Other stations are Ipoh, with 800 kW of Diesel-driven plant, and Seremban, with 580 kW, both to be extended next year, while several smaller installations are scattered about the country. In addition to public supply, inspection on Board of Trade lines is carried out in tin mines, rubber estates, and similar private installations, which have their own plant and transmission systems under the authority of the local Electricity Enactment. All wiring contractors are registered and examinations are held at which certificates of competency are issued to electrical engineers, chargemen, and wiremen. European electrical engineers who can produce satisfactory evidence of training and experience are registered without examination, but all others must obtain a certificate before being allowed to take charge of operating plant. This has raised the general average qualifications of Eurasian and native subordinates, linesmen and wiremen, in a remarkable way during the last few years, as they realise that extra money can be earned by a man with a "ticket," and the examinations are searching enough to ensure that few men risk losing the examination fee by entering before they know their work well. Generally speaking, they are good, but their practice is better than their theory; for instance, a wireman can rarely be caught out on the earthing of motors, &c., but when asked "Why?" about 75 per cent. will say, "It is to keep off lightning"! As a rule the chargeman class is better than the wiremen and the general principle is to have a chargeman over a wiring gang. The chargemen also provide the switchboard attendants and others for work of that nature.

In 1925 the Kuala Lumpur plant sold 2,669,973 kWh, the ratio connections/maximum demand being 1.7. All electrical work in the F.M.S. is controlled by an Electrical Board, to which the chief electrical engineer and inspector acts in an advisory capacity on technical matters. Of non-Government plant subject to the provisions of the Electricity Enactment there was installed at the end of 1925 a total of 18,491 kW, divided up as follows:—Mining, 17,881 kW; agricultural, 253 kW; general, 357 kW.

The Electricity (Supply) Bill.—*The Times* stated on Wednesday that Parliament may adjourn by August 6th, provided that some of the more contentious measures are left over until the autumn. It is expected that the committee stage of the Electricity Bill will be completed by the end of next week. "The delay over the Electricity Bill has been so great that there is little doubt that this will not be passed until the autumn."

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

FIFTY years ago, when his feet were just beginning to grip the lower rungs of the ladder of commercial distinction which he has so successfully climbed, young George Sutton obtained a first-class certificate in book-keeping at the Society of Arts Examination. Sir George Sutton, Baronet, many years chairman and managing director of W. T. Henley's Telegraph Works Co., Ltd., has now found a most fitting and generous way in which to mark the anniversary of that important event in his career, by helping the Society of Arts at a time when it has a deficit of £6,000 on its Building Fund. The widening of the Strand has brought the rear wall of the Society's house into a prominence which was probably never contemplated by its architects, the Brothers Adam. The Council, in its annual report, states that when the house was built, but little attention was paid to the back, and in proximity to the new buildings on either side of it its ugliness becomes painfully manifest. The Council, of which Sir George is a member (as well

as being a vice-president of the Society), desired to take steps to improve the appearance of the wall, but could not because of that deficit. Sir George came to its assistance, and is bearing the whole cost of the decoration of the rear wall; plans have been prepared by Sir Aston Webb & Son, and the work will be carried out during the summer recess.

The absence of Sir HUGO HIRST from the annual meeting of the General Electric Co., Ltd., through ill-health and under the orders of his doctors, draws attention to a very interestng circumstance which was mentioned by Mr. E. G. Byng and Mr. E. Wilson. In the whole of the company's career since 1889, Sir Hugo had never been absent from its meetings until Monday last. Shareholders quite fittingly placed on record their regret. We hope that he will soon be restored to health.

Mr. W. R. SPAVEN, the retiring general manager of the Portsmouth Corporation Tramways, has been presented with a silver coffee set and tray by the employés' club, a chiming clock by the uniformed officials, a leather travelling case by the administrative staff, a set of fish knives and forks by the members of the Tramway Brotherhood, and a silver cigarette box by the Tramway Band. Mrs. Spaven received a hand-bag from the clerical and engineering staff.

Mr. CLARENCE H. MACKAY, the President of the Commercial Cable Company, has been made Commander of the Order of the Crown of Italy by King Victor Emmanuel for his assistance in establishing direct cable communication between Italy and the United States. It will be recalled that the new cable between Rome and New York *via* the Azores was laid early in 1925.

The Tonbridge Urban Council has increased the salary of the electrical engineer from £560 to £640 per annum, and that of the mains superintendent from £255 to £275 per annum, with a further increase to £300 in July, 1927.

Mr. W. T. YOUNG, last week, commenced duty as manager to the Halifax Corporation Tramways. Two days later he welcomed a deputation from the Wakefield Tramways Committee to inspect the railless trolley car system there. Prior to leaving Dundee, Mr. Young was presented by the staff and workmen of the Tramways Department with a silver tea service, the presentation being made by the chairman of the Tramways Committee, Bailie Malcolm.

Mr. PATRICK DILLON, of Thomondgate, Limerick, has been appointed clerk of works to the Shannon power scheme contractors. We are informed that Mr. Dillon, who was formerly a member of the Limerick Town Council, has had considerable experience in the carrying through of important industrial contracts.

Mr. J. C. M. MATTHEWS, M.I.E.E., chief electrical engineer and inspector, Federated Malay States, is shortly retiring on pension after more than 22 years in Malaya. He was in charge of the construction of an 800-kW hydro-electric plant in 1904, which was the commencement of public supply in the F.M.S. Mr. Matthews is succeeded by Mr. D. M. W. Hutchison, B.Sc., A.M.Inst.C.E., his present deputy. Mr. L. V. Fox, A.M.I.E.E., engineer in charge at Kuala Lumpur, will become deputy chief electrical engineer. The engineers in charge at Ipoh and Seremban are, respectively, Mr. E. A. Corbin, A.M.I.E.E., and Mr. H. R. Sparrow, A.M.I.E.E.

Mr. T. G. RICHARDSON, of West Hartlepool, has been appointed general manager of the Rhondda Tramways Co., Ltd.

Sir EDWARD MANVILLE has been elected to a seat on the board of the Metropolitan Railway Company.

At a farewell smoking concert, the staff of the Lothians Electric Power Co. presented Mr. A. C. EVANS with a case of pipes, and Mrs. Evans with an umbrella. The general manager, Mr. H. C. Babb, made the presentation, and on behalf of the staff, wished Mr. Evans prosperity in his new appointment with the City of Birmingham Electricity Department.

Mr. A. M. JACOBS, M.A., M.A.I.E.E., Electricity Commissioner, Union of South Africa, has arrived in this country on a fairly extensive visit. His address in this country will be c/o International Combustion, Ltd., Africa House, Kingsway, London, W.C.2.

Mr. C. A. MAGRATH, chairman of the Hydro-Electric Power Commission of Ontario, has received the degree of Doctor of Laws from the Toronto University.

Mr. J. B. WOODYATT, president of the Southern Canada Power Co., has been elected president of the Canadian Electrical Association for the ensuing year.

The new president of the Canadian Electric Railway Association is Mr. W. R. ROBERTSON, general superintendent of railways for the Hydro-Electric Power Commission of Ontario.

Obituary.—MR. C. S. GILMAN.—We regret to learn that Mr. Charles Storey Gilman, a director of the Westminster Electric Supply Corporation and of the Central Electric Supply Co., passed away suddenly in his sleep on July 4th.

MR. W. H. STEELE.—The death occurred on July 7th of Mr. W. H. Steele, who had for many years been engaged at the Whitehaven power station.

HERR V. TROLLER.—The death recently occurred at Lucerne, at the age of 70 years, of Herr Viktor Troller, one of the pioneers of the electrical industry in Switzerland.

MR. L. COLBERT.—The death took place, on July 3rd, at the age of 61 years, of Mr. Lever Colbert, who was in business as an electrician in Bacup Road, and Fernlea Street, Waterfoot, Ramsbottom.

Will.—The late Lord STUART OF WORTLEY, deputy-chairman of the City and South London Railway Co., and of the London and Suburban Traction Co., Ltd., left £32,639 net personalty.

New Companies Registered.

Wm. Pool, Ltd. (214,809).—Private company. Registered July 3rd. Capital, £500 in £1 shares. Objects:—To carry on the business of electrical and mechanical engineers, wireless dealers, &c. The subscribers (each with one share) are:—W. Pool, 72, St. Peter's Avenue, Cleethorpes, electrical engineer; Mrs. J. Pool, 72, St. Peter's Avenue. W. Pool is one of the directors with power to appoint an additional director.

Sharratt Electrical Co., Ltd. (214,805).—Private company. Registered July 3rd. Capital, £2,000 in £1 shares. Objects:—To carry on the business of electricians, mechanical engineers, and manufacturers, scientific instrument manufacturers and dealers, workers and dealers in electricity, motive power and light, &c. The permanent directors are:—W. Monks, 3, Collison Avenue, Chorley; P. J. Illingworth, 33, Queen's Road, Chorley. Qualification, 1 share. Remuneration as fixed by the company. Secretary: Evelyn Hatch. Solicitor: J. Stanton, 14, High Street, Chorley.

Fraser & Borthwick, Ltd. (14,228).—Private company. Registered in Edinburgh on June 30th. Capital, £20,000 in £1 shares. Objects:—To carry on the business of electrical and mechanical engineers, &c. The directors are: W. Fraser, Fraoch, Bearsden, Glasgow, electrical engineer; W. A. Shand, Auchenibert, Killearn, Stirlingshire, C.A.; F. G. Shand, 81, Hyndland Road, Glasgow. Remuneration: £500 per annum (managing director, £250 per annum extra). Registered office: 59, Pitt Street, Glasgow.

Fullers (Ilford), Ltd. (214,815).—Public company. Registered on July 3rd. Capital, £52,500 in 45,000 10 per cent. preferred ordinary shares of £1 each, and 150,000 deferred shares of 1s. The objects are:—To carry on the business of mechanical and electrical engineers, manufacturers of accumulators and primary batteries, wireless loud speakers and components, &c. Minimum cash subscription: £5,000 shares. The directors are: C. H. Wayte, Manor Cottage, Stoke d'Abernon, Surrey; L. Fuller, "Sunnycroft," Old Road, Frinton-on-Sea; G. j. A. Fuller, "Brooklyn," Loughton, Essex. Qualification: £10 shares. Remuneration of ordinary directors, £100 each per annum (chairman, £200), free of income tax. Solicitors: Kenneth Brown, Baker, Baker, Lennox House, Norfolk Street, Strand, W.C.

D.M., Ltd. (214,865).—Private company. Registered July 7th. Capital, £7,500 in 7,000 5 per cent. cumulative participating preference shares of £1 and 10,000 deferred ordinary shares of 1s. each. Objects: To carry on the business of wireless telegraphy, telephone and general engineers, &c. The provisional directors are:—J. W. Allworthy, 13, Francemary Street, Brockley, Kent; C. A. Cooper, 32, Edward Road, Coulsdon, Surrey. Acting secretary: M. Allworthy. Solicitors: Wakelin Saint & Co., 115, High Holborn, W.C.1. Registered office: 125, Rosebery Avenue, E.C.1.

Starkie & Sparkes, Ltd. (214,885).—Private company. Registered July 7th. Capital, £1,000 in £1 shares. Objects: To acquire the business of electrical engineers and contractors carried on at 35, George Street, Oldham, by E. Starkie and F. Sparkes as "Starkie & Sparkes." The directors are:—E. Starkie, 17, Osborne Road, Oldham, electrical engineer and contractor; F. Sparkes, 330, Park Road, Oldham, electrical engineer and contractor. Qualification, 100 shares. Remuneration as fixed by the company. Solicitor: J. A. Brierley, Priory Building, Union Street, Oldham.

J. J. R., Ltd. (214,931).—Private company. Registered July 9th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless sets and other apparatus, &c. The subscribers (each with one share) are:—W. E. Hollister, 141a, Minories, E.C.3, clerk; A. H. Beggs, 151, Peabody Buildings, Kingsway, W.C.2. The directors are:—J. J. L. Rowe (permanent), N. H. Johnstone and J. Martyn, addresses not stated. Qualification, one share. Solicitors: Kenneth E. Bartlett, 83, Cannon Street, E.C.4.

Midlands Sun-Ray Clinic, Ltd. (214,937).—Private company. Registered July 9th. Capital, £1,000 in £1 shares. Objects:—To carry on the business of a sun-ray and ultra-violet ray clinic or medical institute, &c. The permanent directors are:—M. Nepolsky, 21, Arthur Street, Nottingham, cabinet maker; B. Serabski, 36, Charnwood Street, Derby, manager; N. F. Baylis, 147, Holme Road, West Bridgford, secretary. Qualification, 100 shares. Solicitor: D. R. McNish, 23, King Street, Nottingham. Registered office: 30, Park Row, Nottingham.

Official Returns of Electrical Companies.

Stromberg Motor Devices, Ltd. — Particulars filed of £5,000 debentures and bonus of 20 per cent. authorised June 30th, 1926, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Lancashire Telephone Systems, Ltd.—Satisfaction to the extent of £250 on June 1st, 1926, of charge dated August 9th, 1925, securing £500.

British Automatic Telephone Installation Co., Ltd.—Satisfaction in full on June 29th of debenture dated January 27th, 1926, securing £300.

Wortex Manufacturing Co., Ltd.—First mortgage debenture dated June 30th, 1926, to secure £1,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: C. A. Seabridge, "Gunton," 24, Beauval Road East Dulwich, S.E.

Bordesley Electrical Accessories Co., Ltd.—Satisfaction in full on June 1st, 1926, of mortgage dated September 2nd, 1924, securing £500. Mortgage dated June 2nd, 1926, to secure all moneys due or to become due from the company to Lloyd's Bank, Ltd., not exceeding £1,000, charged on 162, High Street, Bordesley, Birmingham.

Leatherhead and District Electricity Co., Ltd. (70,637).—Capital, £100,000 in 75,000 ordinary and 25,000 preference shares of £1 each. Return dated March 31st, 1926. 48,480 ordinary and 25,000 preference shares taken up. £73,480 paid. Mortgages and charges, £60,950.

Chesham Electric Light and Power Co., Ltd. (90,833).—Capital, £25,000 in £1 shares. Return dated March 16th, 1926. All shares taken up. £10,000 paid. £15,000 considered as paid. Mortgages and charges, £35,000.

Alderley and Wilmslow Electric Supply Co., Ltd. (47,663).—Capital, £40,000 in 20,000 ordinary, 10,000 10 per cent. cumulative preference, and 10,000 5 per cent. preference shares of £1 each. Return dated May 12th, 1926. 20,000 ordinary and 10,000 10 per cent. preference shares taken up. £30,000 paid. Mortgages and charges, £15,000.

Harrison Brothers (Electrical Engineers), Ltd.—Debenture constituting a floating charge on the company's undertaking and property, present and future, including uncalled capital and a specific charge on land at Middlesbrough, and all other freehold or leasehold property of the company, dated June 22nd, 1926, to secure £1,000. Holders: Branch Nominees, Ltd., 15, Bishopsgate, E.C.2.

Kirby (Wimbledon), Ltd.—W. T. Greenland, of 8, Dunmore Road, Wimbledon, was appointed receiver and manager on July 3rd, 1926, under powers contained in debenture dated November 23rd, 1925.

City Notes.

Reports and Meetings of Electrical Companies, Dividend Results, &c.

General Electric Co., Ltd.

The annual meeting was held on Monday at Magnet House, Kingsway. Mr. E. G. Byng, vice-chairman, presided in the absence of Sir Hugo Hirst, the chairman, and in moving the adoption of the report, read a speech which had been prepared by the chairman. In the course of his remarks, Sir Hugo Hirst said that the profit from trading account and income from investments was £47,000 more than the previous year—satisfactory in itself, but short of what, at one period during the year, they were led to expect. The steady upward movement referred to at the two previous meetings as regarded the demands for their products, continued noticeably during the first six months of the last financial year. The moment the coal cloud appeared on the horizon and other labour questions became the topics of the day, progress suddenly stopped, and some of the seeds which they had sown, and from which they hoped to reap, did not mature. They had transferred £120,000 to reserve, as compared with £172,000 last year. In spite of heavy expenditure on loose plant, tools, patterns, fixtures, installations and patents, they had kept these items down to the nominal sum of £1. They had been able to do an increased business, and incur capital expenditure on buildings and machinery of over £100,000, and a similar amount on trade investments, without materially affecting their liquid finances, which were close on £1,150,000. It was a pity that our country did not seem to get a real fighting chance. Things had been settling down, unemployment dropping from week to week and, in the same ratio in which it dropped, their sales seemed to expand. With the exception of a few big and old industries, everybody was beginning to do better, and then came this upheaval which must impoverish the country and enrich our competitors and, if things were not settled quickly, must throw them back again for years. Coal mines were not working, many steel works, potteries and other industries had shut down, other works (including some of their own) had to work reduced hours on account of reduced power supply; and raw materials for many industries were getting scarce. He felt that too many people were trying well-meaningly to settle the coal question, without realising how technically and economically that question had been transformed, how it had ceased to be only a question of wages or hours. It was a new problem arising out of the change which the last quarter of a century had wrought. The application of water power throughout the world, the increasing use of petrol, the higher efficiency of steam-consuming engines and appliances, the increasing utility of electric power, quite apart from the reduced purchasing power of coal-consuming countries—all those factors had collaborated to reduce the importance of and the demand for coal as such. The world wanted derivates of oil—coal contained them. The world wanted fertilisers—coal could supply them. Cheap electricity and cheap gas were wanted plentifully, and only coal could deliver them. Unless mine owners and miners could agree on those fundamentals and on a programme which, in future, could give the country out of coal what it required, coal would never again be produced sufficiently cheaply in this country. In his opinion nothing but a well-thought-out scheme which enabled the fullest application of electrical and chemical science in the production and treatment of coal would give us a real and lasting cheapness of production, would bring us peace in the industry, and enable us again to successfully compete in the export markets of the world. As a company they had therefore a double interest in this question: the impoverishment of their market by the hold-up pending a settlement, and the opportunity of business when the grouping of the mines possible in many districts brought the proper application of electricity within practical politics. The Government in the past had done much good to trade and industry by the Trade Facilities Act, but nothing it had done in that direction could equal the benefits to the country at large when the time came that that Act might extend its benefits to the reconstruction of the coal industry. Referring to the Electricity Bill, he said that he welcomed Mr. Baldwin's statements, and he saw great and lasting good to the electrical and other industries of this country if the Bill passed into law. He realised, however, that when the Bill conceived or envisaged the possibility in the course of 15, 20, or 25 years, of transferring the electricity supply of this country to some 40 or 50 stations, when to-day there were in existence 600, there must be great anxiety somewhere. All those who, with courage, enterprise, and patience risked their capital and nursed into existence the present existing supply companies, must think with anxiety what might happen to them under a Bill which gave great power to an unknown Board or an unknown Government some 15 or 20 years hence. He realised, therefore, why every clause had been carefully scrutinised and possibly amended and, however much he regretted the loss of time occasioned, he believed in the long run it would mean a better Bill. But he did hope nothing untoward would happen to prevent the Bill going through soon. Every day's delay did untold harm. For manufacturers it would prove of particular assistance in their struggle with countries which had a lower standard of living. If, as the Bill provided, after, say, five years, electricity was ubiquitous throughout the country, the opportunity of its use would be greatly enhanced and if, as the Bill provided, voltages and periodicities were gradually becoming standardised the British manufacturer would have at last a chance of proper mass production. He would not only be able then to supply apparatus wanted in the house, factory, and the farm, cheaper, and thus popularise the demand, he would also be able to produce at such prices that he could enter again more freely the markets of the world. He had often pointed out that it was not only exports in pounds, but the character of the exports which counted for the good of the country, and electrical goods made by skilled workers, largely from raw materials produced and finished in this country, were some of the most valuable exports for the purpose of paying for the foodstuffs which they had to import. After years of experience, they noticed that their sales expanded or shrank in almost direct proportion with the Board of Trade returns recording the activities of the country in general. In conclusion, he said that if the general welfare of the country was assured, he had no fear for the future of the company. By what they had created and by the results shown they had justified the capital increase of the company.—The report was adopted.

Brazilian Traction, Light and Power Co., Ltd.

The revenue received from subsidiary companies during 1925 amounted to $8,328,439 (Canadian), and the addition of other sums makes $8,848,594. The net revenue is $8,255,286. Four quarterly dividends at the rate of 1¼ per cent. have been paid on the preference shares, and four at 1 per cent. on the ordinary shares, leaving a surplus of $3,392,020. The gross earnings of the subsidiaries showed an increase of 15.99 per cent., while the net earnings rose by 5.08 per cent. The surplus is added to $5,683,887 brought forward, making $9,075,907. Out of this $3,000,000 has been allocated to general reserve, the balance being carried forward. The report states that the power problem of Rio de Janeiro and Sao Paulo has been solved for many years to come. Except in the case of the telephone system in Sao Paulo, the Brazilian authorities have not yet dealt with the question of increased rates for the company's services. This is necessary in view of the large extensions which will involve further expenditure. The meeting will be held in Toronto on July 29th. The directors have declared a second quarterly dividend of 1¼ per cent. on the ordinary stock in respect of the current year.

Chili Telephone Co., Ltd.

The gross revenue for the year ended March 31st last was £218,578, and the expenditure £147,734, leaving a profit of £70,844, to which is added £3,095 brought forward, making £73,939. It is proposed to pay a final dividend of 3s. per share, free of tax (making 6 per cent., tax free, for the year), to transfer £25,000 to the depreciation and renewals account, and to carry forward £3,939. During the year the number of stations increased by 1,007 to 24,794, and the negotiations with the Chilean Government for a revision of the company's tariffs were satisfactorily concluded. In order to meet the expenditure upon the new automatic plant now in course of installation at Santiago, additional trunk line facilities, and the expansion of the company's service in all directions, it is proposed to increase the authorised capital of the company to £1,000,000 by the creation of 50,000 new shares of £5 each. The meeting was to be held yesterday (Thursday).

Howard and Bullough, Ltd.

Speaking at the annual meeting last week, the chairman, Sir George Bullough, Bt., said that after a period of increased demand orders received for machinery fell off considerably. A steady demand from Germany had suddenly given way, and the higher Customs tariffs put into force some months ago would not make competition for the market any easier. Trade with France was restricted owing to the advantage gained by home manufacturers from the depreciation of the franc, and high tariffs. The Japanese Customs tariff had also been increased, but business was expected from that country when night work was abolished in the cotton mills. He hoped that trade conditions would soon assume a brighter aspect. In conclusion, the chairman drew attention to the large amount shown against "sundry debts," which was due to the necessity for extended payment facilities.

Sir W. G. Armstrong, Whitworth & Co., Ltd.—Messrs. J. D. Siddeley, J. Howson, and J. P. Davison (general sales manager) have joined the board of the company. Mr. J. Frater Taylor has been appointed vice-chairman of the board and chairman of the Executive Committee, while Mr. J. D. Siddeley becomes senior managing director and chairman of the committee of management.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

Aldershot Gas, Water and District Lighting Co. — £62,042 4 per cent. debenture stock; £50,000 new 4 per cent. debenture stock, fully paid.

Auckland Electric Power Board.—£250,000 5 per cent. debentures, 1946, of £100 each (to bearer), issued at 97 per cent., partly and fully paid.

Holophane, Ltd.—100,000 shares of £1 each, fully paid, Nos. 1 to 100,000.

Sevenoaks and District Electricity Co., Ltd.—34,596 preference shares of £1 each, fully paid, Nos. 1 to 34,596; 10,052 ordinary shares of £1 each, fully paid, Nos. 1 to 10,052; and 40,000 new ordinary shares of £1 each (2s. 6d. paid), Nos. 10,053 to 50,052.

Callender's Cable and Construction Co., Ltd.—200,000 ordinary shares of £1 each, fully paid, Nos. 600,001 to 800,000.

Applications have been made to the Committee to allow the following to be quoted officially:—

Callender's Cable and Construction Co., Ltd.—200,000 ordinary shares of £1 each, fully paid, Nos. 600,001 to 800,000.

Montreal Tramways Co.—$2,217,000 Series "B" 5 per cent. general and refunding mortgage sinking fund gold bonds, due April 1st, 1955.

Kalgoorlie Electric Tramways, Ltd.—Presiding at the annual meeting, on July 8th, Mr. A. H. P. Stoneham (chairman) said that although the receipts were unsatisfactory they would have been lower had their manager in Western Australia not made arrangements to deal with the competition from motor omnibuses. The company was suffering from the decline of the population; in 20 years the population of the goldfields district had fallen from 33,000 to about 10,000. The pastoralists were prospering, which would benefit the company to some extent, but it was to the mines that the company had to look. There were still immense reserves of low-grade ore, and it was hoped that the Government would render assistance to enable them to be dealt with.

Yorkshire (Woollen District) Electric Tramways, Ltd.—The revenue for the past year was £175,233, and after meeting all expenses and allocating £25,700 to renewals, and adding £35,199 brought forward, there remains £57,710. It is proposed to transfer £10,000 to reserve and to pay a dividend of 6 per cent. on the ordinary shares, as in 1924. Also, in pursuance of the directors' policy of maintaining the dividend at this rate, it is proposed to pay a further 3 per cent. in respect of 1921, when no dividend was paid. This will leave £29,272 to be carried forward. The meeting was to be held on Wednesday last.

Mirrlees, Bickerton & Day, Ltd.—The accounts for the year ended March 31st last include the cost of amalgamation with the Mirrlees Watson Co., Ltd., while the item "goodwill" has been completely written off. The net profit was £17,732, and to this is added £7,033 brought forward, making £24,765. It is proposed to pay the remainder of the preference dividends and to repay recovered Dominion income tax on preference dividends. The balance (£21,244) is carried forward in view of the payments to shareholders at the time of the amalgamation. Meeting: July 20th.

Barnsley and District Traction Co., Ltd.—The report for 1925 shows a total revenue of £198,024 and a profit, after meeting expenses and transferring £28,000 to renewals fund, of £1,776. To this is added £23,477 brought forward, making £25,253. A final dividend of 5 per cent. on the ordinary shares is recommended (making 10 per cent. for the year), and £17,703 is to be carried forward. The previous year's dividend was 15 per cent. A total of £43,113 was spent on capital account during the year. Mr. W. S. Wreathall has been appointed to the board. The meeting was to be held on Wednesday last.

Companies Struck off the Register.—The names of the undermentioned companies have been struck off the Register, and they are thereby dissolved:—

Amalgamated Radio-Telegraph Co., Ltd.
City Electric Welding Co. (Newcastle), Ltd.
Egyptian Power and Nitrogen Syndicate, Ltd.
Electrical Development and Finance Corporation, Ltd.

Petters, Ltd.—The net profit for the year 1925-26 was £23,516, as compared with £25,087 in the preceding year. The addition of the balance brought forward makes available £47,047. Out of this a dividend of 5 per cent. is paid on the ordinary shares and £10,000 is transferred to reserve; £24,047 is carried forward.

Dungarvan Electric Light Co.—At the annual meeting last week the chairman (Mr. T. Power) stated that the number of consumers had increased. After meeting all charges, a balance of £524 remained. This was utilised in the reduction of the company's formation charges.

Lisbon Electric Tramways, Ltd.—The directors have declared a two-years' dividend on the cumulative preference shares, bringing the payment of arrears up to December 31st, 1922. The dividend is now outstanding in respect of the years 1923 and 1924, that for last year having been paid.

Burndept Wireless, Ltd.—Sir Alexander Spearman, Bart., has sent a *questionnaire* to the shareholders regarding their holdings and the affairs of the company. The result is, presumably, to be made known at the company's annual meeting to-day (Friday).

Smithfield Markets Electric Supply Co., Ltd.—An interim dividend of 3 per cent. has been declared on the ordinary shares.

Cork Electric Tramways and Lighting Co., Ltd.—The directors have declared an interim dividend of 3 per cent. on the ordinary shares.

Great Northern Telegraph Co., Ltd., of Denmark.—An interim dividend of 2½ per cent. (actual) has been declared.

Stocks and Shares.

MONDAY EVENING.

STOCK Exchange markets and prices have fallen under something of a cloud. The precise reason for this would be difficult to define. Possibly the rise of the past few months has been overdone, and speculation begins to realise that the coal stoppage has to be paid for, sooner or later. Floods of new issues begin to make their influence felt when monetary conditions, refusing to fulfil sanguine expectations, become tighter instead of easier. Hopes of an early reduction in the Bank Rate have almost evaporated. The immediate cause of the reaction amongst industrial shares is a very unlooked-for reduction in the interim dividend on Courtaulds, the shares of the famous artificial silk company. A slump in the price of these has aroused uneasiness amongst wide circles. The Stock Exchange awaits a set of new buyers.

Various electrical and cable manufacturing shares have declined. One exception is Telegraph Construction, where the price has fully recovered the dividend, of 6s. net, deducted last account-day. Another is British Aluminium ordinary, which has risen to 48s. 9d. Falls occurred, however, in British Insulated, Callenders, Brush, English Electric, and the newly-issued Telephone Manufacturing shares. The last have dropped to 1s. 3d. discount below the 7s. 6d. at which they were offered to the public. Enfield Cable ordinary keep steady at 3¼. Active dealings are taking place in Victoria Falls ordinary on the basis of 55s., and in the preference around 33s. 9d. An outburst of animation in South African mining shares is responsible for the attention now devoted to the Victoria Falls issues.

Widely-circulated advices to buy "Sidro" shares have brought inquiries for particulars concerning the company, the full title of which is the Societé Internationale d'Energie Hydro-Electrique. This is a Belgian Company with large interests in the Barcelona Traction Company and in the Mexico Tramways Company, which latter controls the Mexican Light and Power Company. The attraction claimed for "Sidro" shares at their current price is that a purchase enables the buyer to obtain an interest in the two above-mentioned companies at a lower figure than would be possible by purchasing the shares or bonds of those companies in the open market. In addition, the "Sidro" has other holdings and further possibilities. The price of the shares is about 9¼, the nominal denomination being 250 Belgian francs. The speculative nature of the shares is apparent from the character of the companies in which the "Sidro" is most largely interested.

Mexican Utility stocks are firmer, the feature being a gain of 4 points in Mexican Light & Power preferred. The buying that has put up the price is based upon the hope, several times reflected here of late, that resumption of dividend payments may be possible soon, and that a scheme for dealing with the dividend arrears is likely to be publicly announced before long. Another substantial rise in this section is one of 5 points in Brazilian Tractions, the annual report showing a net revenue of 8¼ million dollars. This is about $600,000 better than last year, and 1¼ million dollars higher than the 1923 results. A quarterly dividend of 1¼ per cent. is again declared.

British Columbia Electric Railway stocks continue to advance, and Anglo-Argentine Tramways 5 per cent. debenture is 1 higher at 74½.

Electricity supply shares are steady. St. James' and Pall Mall are 5s. up at 16¾. South Londons strengthened to 2¼, and Urban preference gained the pence at 20s. 6d. Lancashire Lights and Bournemouths have gone back a trifle. Egham and Staines Electric 7½ per cent. preference are obtainable at 23s., ex dividend, to pay 6¼ per cent. on the money. The British Electric Traction stocks show no change. Two members of the company's group have issued their reports within the last few days. One is the Barnsley and District Traction, whose dividend is 10 per cent. against 15 per cent., the decrease being due to a big advance in the ratio of expenses, and appropriations for repairs. The second company, Yorkshire (Woollen District) Electric Tramways, has been more fortunate, the dividend being raised from 6 per cent. to 9 per cent., although the extra 3 per cent. is understood to be in respect of 1921, when nothing was paid.

The Eastern cable stocks remain in considerable favour, and the prices have again gone ahead. Globe ordinary are up to the high figure of 19½. Eastern Extensions recovered the dividend deduction of 5s., and added a similar amount to their quotation. Eastern is 2½ up and Westerns have a gain of 5s. on the week. Indo-Europeans rose 1 to 46½. Chili Telephones improved to 7 on an excellent report. The meeting is to be held on Thursday in this week. The company's capital is to be raised to a million pounds sterling by the creation of 50,000 new shares of £5 each, and these will doubtless be offered at a price which will afford a bonus to proprietors.

Home Railway stocks are very dull as a whole, but Underground Incomes have risen to 102. Amongst last week's new issues was one of £250,000 Auckland Electric Power Board 5 per cent. debentures, offered at 97. The money is required for extension of the Board's policy of large-scale electricity generation and distribution, and the security is excellent. The greater part of the money is to be spent on materials in this country. Engineering shares are disposed to droop, but Babcocks remain at 51s. The rubber share market is quietly hard. Wireless shares are listless and neglected.

Share List of Electrical Companies.

	Nom. £	Dividend. 1924	1925.	Price July 12 1926.	Rise or fall.	Yield. p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	14	14	56/3	—1/-	4 19 8
Brompton Ordinary	1	10	10	31/9	—	*6 6 1
Charing Cross Ordinary	1	15	15	45/9	—	6 10 10
do. do. 4½ Pref	1	4½	4½	17/-	—	5 5 11
Chelsea	1	12	12	2	—	6 0 0
City of London	1	15	15	48/9	—	6 4 4
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Clyde Valley	1	8	8	27/-	—	5 18 6
County of London	1	15	15	59/6	—	5 0 10
do. do. 6 % Pref.	1	6	6	22/6	—	5 6 8
Edmundson's Ordinary	1	7	8	24/-	—	6 13 4
do. 7% Pref.	1	6	7	22/6xd	—	6 4 5
Elec. Supply Corporation	1	10	10	31/3	—	6 8 0
Kensington Ordinary	5	15	15	13⅜	—	5 9 1
Lancs. Light and Power	1	7½	7½	24/-	—6d.	6 5 0
London Electric	1	10	10	32/6	—	6 3 1
do. do. 6% Pref.	5	6	6	5⅞	—	5 10 8
Metropolitan	1	11	11	37/-	—	5 18 11
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	5	5½	6	21/-	—	5 13 1
Newcastle-on-Tyne Ordinary	1	7	7	22/-	—	6 7 3
do. 5% Pref.	1	5	5	18/-	—	5 11 1
do. 7% Pref.	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	10	—	6 0 0
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	16⅝	+½	5 6 10
South London	1	15	15	2⅝	+⅛	5 14 3
South Metropolitan Pref.	1	7	7	26/3	—	5 6 8
Urban Ordinary	1	4	7	1⅛	—	6 11 9
do. 6% Pref.	1	6	6	20/6	+6d.	5 17 1
Westminster Ordinary	1	15	15	48/3	—	6 18 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	20/3	—	7 8 0
Yorkshire Elec.	1	8	8	27/-	—	5 18 6
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	69	—	5 15 11
Metropolitan	,,	5	5	64½	—	7 15 0
do. District	,,	8½	8½	53½	—	6 10 10
Underground Electric Ordinary	10	Nil	Nil	2⅞	—	Nil
do. do. "A"	1/-	Nil	Nil	11/6	—	Nil
do. do. Income	Bonds	6	6	102	+1	*5 17 10
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	105	—	5 14 8
do. Def.	,,	1½	1½	24½	—	6 2 5
Automatic Telephone	1	3	6	2½	—	4 0 0
Chili Telephone	5	5	6	7	+⅛	*4 5 9
Cuba Sub. Ord.	10	5	5	6⅞	—	7 8 2
Eastern Extension	10	10	10	18½xd	+½	*5 6 8
Eastern Tel. Ord.	Stock	10	10	185xd	+2½	*5 8 1
Globe Tel. and T. Ord.	10	10	10	19½	+½	*5 4 8
do. do. Pref.	10	6	6	11	—	5 9 1
Great Northern Tel.	10	22	20	27	—	7 7 1
Indo-European	25	8½	10	42½	+1	*5 7 6
Marconi	1	10	10	1⅝	—	6 17 10
Marconi Marine	1	10	7½	21/3	—	7 1 3
Oriental Telephone Ord.	1	12	12	45/-	—	*5 6 8
United R. Plate Tel.	5	8	8	8⅛	+⅛	*4 18 6
Western Telegraph	10	10	10	18½	+½	*5 9 7
HOME AND FOREIGN TRAMS, &c.						
Anglo-Arg. Trams First Pref.	5	5½	5½	3⅞	—	6 6 0
do. do. 2nd Pref.	5	6	6	2¾	—	10 8 8
do. do. 5% Deb.	Stock	5	5	74½	+1	6 14 1
British Electric Traction Ord.	,,	7	8	140	—	5 14 4
do. do. 6% Pref.	,,	6	6	110	—	5 9 1
Brazil Traction	100	4	5	105	+5	4 15 3
Brit. Columbia Elec. Rly. Pcs.	Stock	5	5	86½xd	—	5 17 0
do. do. Preferred	,,	96/-	126/9	105½	+1	*6 0 4
do. do. Deferred	,,	129/5	8	130	+1	*6 3 0
do. do. Deb.	,,	4½	4½	78	—	5 9 0
London & Sub. Trac. 5% Pref.	1	2½	Nil	6/-	—	Nil
London United Tram. Deb.	Stock	4	4	47	—	8 10 2
México Trams 5% Bonds	—	5	5	72½	—	6 18 0
Mexican Light Common	100	Nil	Nil	32½	—	Nil
do. Pref.	100	Nil	Nil	83½	+4	Nil
do. 1st Bonds	—	5	5	72½	—	6 17 11
Yorkshire (West Riding)	1	5	—	11/6	+6d.	... ...
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1	12	18	51/-	—	*5 2 0
British Aluminium Ord.	1	5	10	48/9	+6d.	4 2 0
British Elec. Transformer Pref.	1	Nil	7	18/9	—	7 9 4
British Insulated Ord.	1	15	15	3⅞	—⅛	4 7 3
Brush Ord.	1	10	10	1½	—⅛	8 0 0
Callenders	1	15	15	3½	—⅛	4 12 4
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	13/8	—	... ...
Edison-Swan	4/-	10	10	10/-	—	4 0 0
do. 5% Deb.	Stock	5	5	82	—	6 1 11
Electric Construction	1	10	10	32/-	—	6 0 0
Enfield Cable, Pref.	1	7½	7½	1½	—	6 6 4
English Electric	1	5	Nil	15/-	—6d.	... ...
do. do. Pref.	1	6	6	19/-	—	6 6 4
Gen. Elec. Pref.	1	6½	6½	23/-	—	5 13 1
,, Ord.	1	5	7½	30/6	—	4 18 4
Henley	1	16	20	3½	—	5 3 3
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	5	23/-	—	*4 6 11
Johnson & Phillips	1	10	17½	8½	—	5 7 8
Met.-Vickers Ord.	1	8	8	1½	—	6 8 0
do. Pref.	2	8	8	2½	—	6 8 0
Siemens Ord.	1	7½	7½	28/-	—	5 7 4
Telegraph Construction	12	20	10	29½xd	+½	*4 4 0

*Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances

CHEMICALS, &c.	Price July 13th.	Fortnight's inc. or dec.
a Acid, Oxalic per lb.	5¾d.	...
a Ammoniac, Sal per ton.	£60	...
a Ammonia, Muriate (large crystal) ,,	£52	...
a Bisulphide of Carbon ,,	...	...
a Borax ,,	£25	...
a Copper Sulphate ,,	£25 10s.	...
a Potash, Chlorate per lb.	4d. to 4¼d.	...
a ,, Perchlorate ,,	5½d.	...
a Shellac per cwt.	£15 15s.	...
a Sulphur, Commercial ,,	£9 10s.	...
a ,, Roll ,,	£9 10s.	...
a Soda, Chlorate per lb.	3¾d. to 3¾d.	...
a ,, Crystals per ton.	£5 to £5 5s.	...
a Sodium Bichromate, casks per lb.	4d.	...
METALS, &c.		
b Aluminium, Ingots per ton.	£120 to £125	...
b ,, Wire per lb.	1/9 to 2/6*	...
b ,, Sheet ,,	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—		
Grade I per ton net.	£251	£5 inc.
Grade II ,, ,,	£174	£3 inc.
Grade III ,, ,,	£95	£1 inc.
c Brass (rolled metal 2" to 12" basis) per lb.	9¾d.	...
c ,, Tubes (solid drawn) ,,	11¾d. to 1/-	...
c ,, Wire, basis ,,	9¾d.	...
c Copper Tubes (solid drawn) ,,	1/0½	...
c ,, Bars (best selected) per ton.	£90	...
c ,, Sheet ,,	£90	...
c ,, Rod ,,	£90	...
d ,, (Electrolytic) Bars ,,	£66	10/- inc.
d ,, ,, Sheets ,,	£148 10s.	...
d ,, ,, Wire Rods ,,	£76	10/- inc.
d ,, ,, H.C. Wire per lb.	9⅞d.	⅛ inc.
f Ebonite Rod ,,	2/3 to 2/6	...
f ,, Sheet ,,	2/3 to 2/6	...
n German Silver Wire ,,	2/2	...
h Gutta-percha, fine ,,	8/-	...
h India-rubber, Para fine ,,	1/7½	½d. dec.
i Iron Pig (Cleveland No. 3.) per ton.	72/6	...
l ,, Wire, galv. No. 8, P.O. qual. ,,	£21	...
g Lead, English pig ,,	£33 15s.	£2 5s. inc.
g Mercury per bot.	£15 7s. 6d. to £15 10s.	...
e Mica (in original cases) small per lb.	3d. to 3/-	...
e ,, ,, medium ,,	4/- to 8/-	...
e ,, ,, large ,,	10/ to 20/- & up.	...
p Phosphor Bronze, plain castings ,,	1/3½	...
p ,, ,, drawn bars & rods ,,	1/3	...
p ,, ,, rolled strip & sheet ,,	1/2½	...
p ,, ,, wire ,,	1/3½	...
o Platinum per oz.	£23 10s.	...
d Silicium Bronze Wire per lb.	11½d.	½d. dec.
r Steel, Magnet, in bars ,,	7½d.	...
n Tin, Block (English) per ton.	£276 5s. to £277 5s.	£5 5s. to £6 5s. inc.
n ,, Wire, Nos. 1 to 16 per lb.	4/1	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

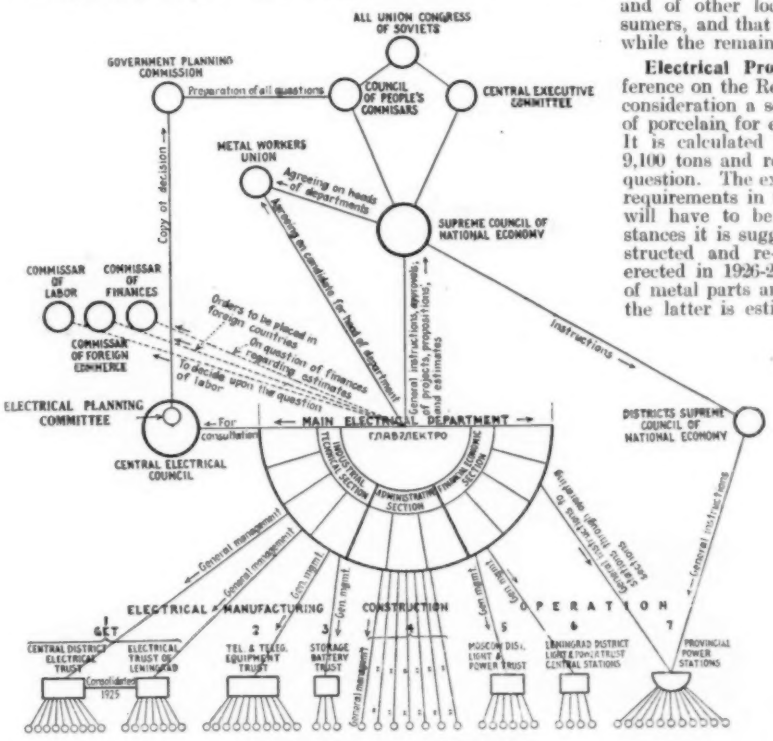
a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Indian Electrical Schemes.—Some particulars are given in the *Mining Electrical Engineer* of the latest development of the Tata electrical schemes. This provides for a hydro-electric power station at Bhira, and the transmission to Bombay by an overhead line, about 75 miles long, of some 100,000 h.p. The energy is to be generated at 11,000 V, 50 cycles, 3-phase, and the pressure raised to 110,000 V for transmission, and transformed down again to 23,000 V for the main distribution. At the power station there are four banks of transformers, each bank consisting of three single-phase units and having an output of 30,000 kVA. At the receiving station in Bombay there are four banks of transformers, each bank having an output of 27,000 kVA, and consisting of three single-phase units. The weight of each transformer core with windings is 46,000 lb., the weight of the tank complete with all its fittings being 26,000 lb. Each unit requires 4,000 gallons of oil weighing 35,000 lb. The height of the tank is over 16 ft., and the floor-space dimensions are 11 ft. by 8 ft. For shipment the tank was packed lying on one of the half-round ends in a special cradle, and all the fittings were removed and packed separately. A very strong wooden case was built round the core and coils in such a way that the lifting lugs mounted on the top main frame of the transformer projected through the top of the case. The apparatus was dried out on site by building a fireproof housing round the core and coils and blowing hot air through it. Baffles were provided to direct the flow of air in the most efficient manner, and at the same time current was circulated in the windings.

Russian Electrical Notes.

Russian-American Hydro-Electric Agreement. — The *Electrical World* reports that an agreement has been signed between the American firm of Hugh L. Cooper & Co. and representatives of the Soviet Government, by which the Russians will obtain American advice and direction in building the great hydro-electric system which they are planning to set up in the Ukraine. By the contract, Hugh L. Cooper and Company undertake to make a complete survey of the Russian project, which involves construction of a generating station on the Dnieper River with an ultimate capacity of about 600,000 h.p., a canal and lock system to open the river for navigation below Ekaterinoslav, a railway connecting the iron ore deposits of Krivoy Rog, the manganese deposits of Nikopol and the Donetz coal basin, and a transmission line to convey electric power to present and potential markets. Representatives of the American company will start for Russia next month. Colonel Cooper will follow them to make a final examination. It is claimed that with the utilisation of the water power of the Dnieper and Southern Boug rivers the exploitation of the rich resources of this region will become considerably less expensive than at present and its development will be greatly accelerated. As an initial step the Dnieper power project includes the construction of new metallurgical plants, ferro-manganese works, aluminium works, and the production of electrolytic steel to be fed by the new hydro-electric construction.

The Organisation of the Electrical Industry.—We are indebted to our contemporary, the *Electrical World*, for the accompanying diagram, which shows in a graphic manner the



The Russian Electrical Organisation.

relationships existing between the various bodies to which these notes make reference from time to time. The terminal circles at the bottom of the diagram represent the factories, generating stations, &c., under the control of the various trusts. To economise space their names have been omitted.

Tramways.—According to a report presented to the tramcar construction section of the Metal Syndicate, the number of tramway undertakings in operation increased from 35 in 1914 to 41 in 1925, and the number of passengers carried has risen from 915,000,000 to 962,000,000. The construction of new tramways is expected to take place this year in Tule, Stalin and Iv-Boznecensk. A demand for 704 new tramcars, of which 549 are motor cars, has been presented for this year (1925-26), but as the capacity of the works engaged on this class of work is only 400 cars, there will be a deficiency of 304 cars.

Odessa Extensions.—A scheme has been provisionally approved by the Electrical Planning Commission for the extension of the station at Odessa by the installation of two new 10,000-kW turbo-generators, one of which it is proposed to set in operation in December, 1927, and the other a year later. The question of obtaining the plant from abroad has been left open, as it can only be decided in accordance with the productive plan of the Russian manufacturing trusts.

North Caucasian Station.—As a result of the deterioration of the existing station in Novorossisk, and the demand of the cement industry and other consumers, the Electrical Planning Commission has decided that it is necessary to begin work immediately in connection with the construction of a new works of a capacity of 20,000 kW in two sets. The North Caucasian Soviet has been requested to submit a scheme for the financing of the undertaking with the participation of local consumers, particularly the cement industry.

Lamp Production.—It is calculated that the demand for lamps will increase from 19,000,000 in 1926-27 to 31,000,000 in 1929-30. At present lamps are manufactured at the factories of the Svetlana, in Leningrad, and in the Elochovsk and Kudrinsk works in Moscow, but in the course of the next five years it is proposed to concentrate the production in two works in Moscow and Leningrad respectively, each of which is to turn out about 15,000,000 lamps annually. The expenditure, including that on a glass works, is computed at 7,000,000 roubles. It is reckoned that after this development it will be unnecessary to import lamps from abroad, except special lamps which are not made in Russia.

The Briansk District.—The Electrical Planning Commission has decided that it is economically possible to proceed with the construction of a peat fuel station of a capacity of 48,000 kW, for the Southern district of Briansk. A beginning is to be made in 1926-27, so that the first generator (16,000 kW) may be put into operation in 1928. It is suggested that a company should be formed for the purpose with the participation of the engineering combination known as the Gomza, and of other local undertakings which would become consumers, and that these should provide two-thirds of the capital, while the remaining third would be provided by the State.

Electrical Production.—The Board of the Special Conference on the Restoration of Industrial Capital has had under consideration a scheme for the development of the production of porcelain for electrical purposes during the next five years. It is calculated that the demand this year will amount to 9,100 tons and reach 19,300 tons at the end of the period in question. The existing works, however, will be unable to meet requirements in the next two or three years and the balance will have to be obtained from abroad. Under the circumstances it is suggested that the Artem works should be reconstructed and re-equipped and that a new works should be erected in 1926-27 for the production of porcelain, as well as of metal parts and fittings for insulators. The expenditure on the latter is estimated at 3,680,000 roubles and that on the expansion of the porcelain industry during the five years at 4,430,000 roubles.

The Board has also under consideration a scheme for the development of the output of the accumulator industry from a value of 1,800,000 pre-war roubles in the current year to 11,600,000 roubles in 1929-30. It is calculated that the growth in the demand will largely be brought about by the extension of broadcasting and aviation. At present the manufacture of accumulators is concentrated at two works situated in Leningrad, and extensions of the plant are to be the means of increasing the output to a sale value of 5,700,000 pre-war roubles at the end of the fifth year. It will also be necessary to construct two new accumulator works next year, one of which will produce alkaline accumulators, which were not made in Russia in 1914. The second works, which is to turn out acid accumulators, is to be erected at Saratoff.

Another matter which has been studied by the Board is the development of the production of installation materials. It is suggested that the Dinamo Works, Moscow, and No. 1 Electrosil, Kharkoff, should discontinue the production of these materials, and that the work should be concentrated at the Electrik Works, Leningrad, while the Karbolit Works is to limit its production to insulating materials only. In addition, it is recommended that a new works should be built and the total value of the production increased from 2,000,000 roubles to about 11,000,000 roubles in five years.

Measuring Instruments.—The Supreme Council of National Economy has applied to the Council of Labour and Defence for permission for the Low-Tension Trust to include in its this year's capital expenditure the construction of a works for the production of measuring instruments of an annual value of 5,000,000 roubles. The outlay on the suggested works is computed at 1,700,000 roubles.

Railway Electrification.—It is expected that the electrification of the Moscow-Mitisch Northern Railway will be completed and the line opened for traffic at the beginning of 1928. The contract with the Proletarsk Works (Mitisch Works) for the delivery of the 25 coaches, is now being prepared.

Hydro-Electric Works.—The results of a preliminary investigation of the water powers in the region of Altai and the suggested construction of a works on the River Ube, have

been under the consideration of the Electrical Planning Commission, with the object of obtaining a supply of energy for the south-western district of the Altai. As economic aspect of the scheme has not been investigated, the question has been referred to the General Electrical Commission to inquire into the matter.

Aluminium Production.—The North-Western Industrial Bureau has brought forward a scheme for the construction of two works for the production of aluminium at an estimated outlay of 36,000,000 roubles, to be spread over a period of five years.

Unsatisfactory Transformers.—The managers of the Volkhoff station report that of the eight transformers ordered from the State Electrical Trust, seven have been delivered from the Kharkoff works and found to be defective owing to unsatisfactory construction. In the circumstances they have applied to the economic organisations with a view to their adopting measures to ensure that the Trust shall supply machines free from faults.

Leningrad Supply Difficulties.—The supply problem in Leningrad has recently been intensified, as the stations have been working without any reserve plant, and it is only now that a reserve of 5,000 kilowatts has become available through the repair of a turbo-generator. The starting of the Volkhof station, which is to serve Leningrad, has been fixed for this summer, and the transmission line to Leningrad is already installed. The inauguration of this station and the placing in service of a second generator at the Krasnaya October station in February next, will radically solve the problem of the supply of Leningrad in the lighting season of 1926-27, but with the further growth in the demand other stations will be required, and the competent authority in due course will consider the question of the construction of a new peat fuel station for Leningrad. In the near future the "first" Leningrad station will change over some of its boilers to the use of coal, which for the first time in Russia will be consumed in a pulverised form.

An A.C. Lift Controller.

A Typical Example of Electric Control, Ltd.'s Gear.

THE chief considerations that affect the choice of d.c. or a.c. motors for driving lifts are reliability in operation, rapid and even acceleration, and quick and accurate stopping at floor levels. For some time d.c. motors have been favoured as providing better acceleration and braking features; suitable a.c. motors are, however, now available, which give satisfactory service with regard to these two points.

There still seems to be, in some directions, an idea that lifts operated by d.c. motors are more reliable than those operated by a.c. motors. That this impression is fallacious, however, is proved by the fact that a.c. motors are used just as freely as d.c. motors, and with equally reliable and satisfactory results, for such severe duties as controlling steel-works auxiliaries. For this particular service reliability in operation is of paramount importance; the frequency of operation is generally very much more severe than in the case of lifts,

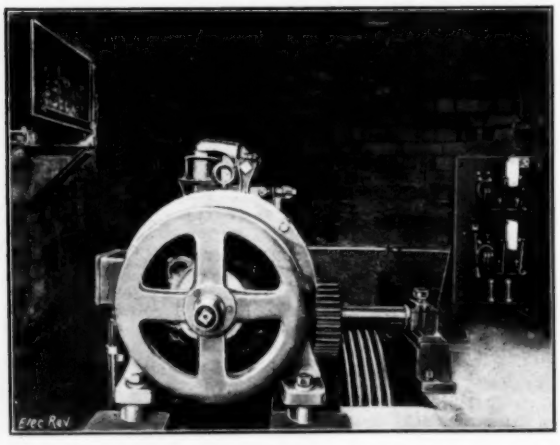


Fig. 1.—Marryat & Scott Equipment, showing Lift Machine, Automatic Controller, and Contactor-Operated Brake.

the starting currents are much heavier, and the conditions generally are admitted to be much more arduous. With regard to the control gear, it is a fact that an automatic controller for an a.c. lift is simpler than a d.c. controller, because it has fewer working parts, and less complication in the way of interlocks and relays, which means reliability in operation and lower costs, both initially and for maintenance.

A typical example of a modern a.c. lift controller, manufactured by Messrs. Electric Control, Ltd., of Glasgow, is illustrated by fig. 1. It controls, by means of a switch in the car, a goods lift in a busy factory, but so far as the equipment is concerned, it is identical with that used for a passenger lift of the switch-in-car type in a busy store, or residential building.

The equipment, which is for a 10-h.p., 3-phase, slip-ring motor, comprises two double pole reversing stator contactors, mechanically interlocked, mounted on a slate base, with a pair of control circuit fuses and an angle iron framework for floor mounting; a patent "Eddystat" rotor controller for accelerating and decelerating purposes, and a contactor-operated brake. The diagram (fig. 2) shows the simplicity of the electrical connections, and yet the equipment is complete, and is claimed to include everything necessary for the safe and satisfactory operation of the lift under all conditions.

The reversers are operated by direct-acting contactor-type magnets without any complicated links or spring mechanism

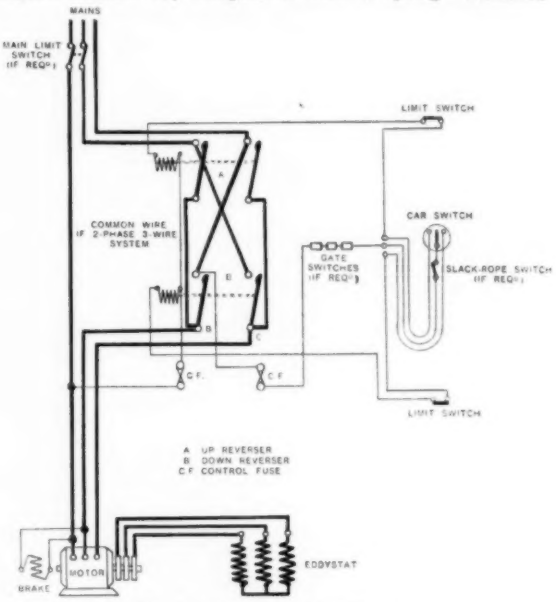


Fig. 2.—Diagram of Connections.

and no electrical interlocks of any kind, these being unnecessary because of the mechanical interlock and the "Eddystat" in the rotor circuit; the number of wearing parts is thus reduced to a minimum, the design being so simple that delicate means of adjustment are entirely obviated.

The "Eddystat" rotor controller has no moving parts whatever, and is purely electrical in operation. It provides maximum torque at switch-on and accelerates the motor in the shortest time consistent with safety, and with a complete elimination of current increments, or jerks, during acceleration. On reversal it provides a powerful electrical braking effort, again without any jerks. The "Eddystat" requires no adjustment after it is once installed, and therefore costs nothing in the way of maintenance charges.

The brake is also of the contactor type, with a direct-acting magnet of the same design as that used in the reversing contactors. Thus, the old-fashioned type of a.c. solenoid with its floating plunger and toggle and link mechanism is entirely dispensed with. By the addition of contactor floor-type floor-selecting relays to the reverser panel, the equipment can be made equally suitable for fully automatic push-button controllers operated by the lift passenger.

International Exhibition at Bâle.—Though the real object of the Bâle Exhibition is the development of inland navigation, water-power is so closely allied to electricity that specialists in electrical engineering are very numerous at Bâle. More than seventeen nations are represented at this exhibition, which is the first of its kind, and one likely to have considerable influence on international communication and trade. Apart from the models purely hydraulic, and the various plans and bas-reliefs of river ports, there are very ingenious hydro-electric working models shown by Lausanne engineers. One of these is particularly interesting. A model of a low-fall power station at Geneva is linked up with the high-pressure one of Fully. When the output which feeds turbine No. 1 is insufficient (as shown by a diagram) the second turbine automatically comes into play to furnish the necessary energy; and by electric lamps which, one after the other, light up the direction of the connecting line, the onlooker is enabled to see both the direction and the pressure of the current. This model is only one of many in Hall II, and electrical engineers passing their holidays in Switzerland, could do worse than while away a few hours in this exhibition, open until September 15th. An electric crane, capable of lifting 3,000 kg., hoists a little car carrying six persons sufficiently high for them to have a capital view, not only of the exhibition, but also of the city of Bâle, while the Amusement Park has excellent restaurants (to suit all purses), one of which is on board a model steamer, with dancing on the deck.

The Tramways and Light Railways Association—II.*

The Seventeenth Congress at Torquay.

Annual General Meeting.

At the 29th annual general business meeting of the Association the report and accounts for the past year were presented. There was a small surplus on the year's working. Dealing with some of the activities during the year, the Chairman referred to motor-'bus competition and expressed regret that it had been impossible yet to get the Minister of Transport to take action in the matter. The question had been brought to the notice of the Ministry from time to time, and recently the case of the Lanarkshire Tramways had been specially mentioned. In the matter of road maintenance, also, representations had been made to the Ministry of Transport for steps to be taken to relieve the tramway undertakings of a considerable portion of the burden imposed upon them in this connection. The Council was not without hope that its efforts would sooner or later be fruitful.

Report on Tramway Rolling Stock.

Mr. C. J. SPENCER, in introducing the report of the Joint Committee on Tramway Rolling Stock, spoke of the importance of the co-operation there had been in the matter between the two tramway associations. Whilst he had been chairman of the Joint Committee, the bulk of the work had been delegated to sub-committees, and to them must be given the credit and responsibility for what appeared in the report, which must be taken as representing an average view and a compromise, having regard to the varying circumstances of the different tramway undertakings in the country. They in this country were a little behind their brethren on the Continent and in America with regard to research, and he could not help feeling that they were now paying the penalty of neglect, in the past, of research. The report indicated the directions in which there was room for considerable improvement. The tramway industry had stood still whilst the motor-'bus industry had been making gigantic strides, and the tramway people had failed to make the fullest use of the advantages which they possessed, because, in the use of a vehicle running with steel wheels on a steel track, there were possibilities of using vehicles of almost any capacity, within reason, inasmuch as there were not the same limitations of weight and size that were obviously necessary with the ordinary road vehicle. No other form of transport in the streets could compete with tramways for handling mass traffic. The important problem in designing tramcars was that they should be made so comfortable that they would attract the traffic during the slack hours of the day. During the peak hours the traffic looked after itself, and therefore it paid hands down to improve the cars in every possible way in order to attract traffic at times other than peak periods. It was possible to save 10 per cent. on the schedules by having cars which were loaded at one end and unloaded at the other. Referring to the report of the sub-committee concerned with trucks and equipment, Mr. Spencer made special reference to the use of high-speed motors and the elimination of unsprung weight and, commenting on the problem of tramcar control, urged the importance of devising some means which would obviate the present notch controller and introduce in its place a gradual method of acceleration such as was obtained in motor-'bus and motor-car control. That was a problem to which all tramway men should turn their attention; it should be possible to get perfectly smooth acceleration of 4 or 5, or even 6 ft. per sec. against the present limit of 2 or 3 ft.

The Report.—*Abstract.*

THE report is composed of the two Sectional Committees' reports dealing with "Car Bodies" and "Trucks and Equipment" separately.

The Car Bodies Committee has considered the answers to questions addressed to members on the subject of the protection of motormen from draught, and has arrived at the conclusion that for a tramcar with an entirely closed top-deck some type of draught preventer appears to be desirable. The provision of vestibule protection does not appear to have caused any reduction in sickness of drivers, and in a number of undertakings that have not adopted such protection no requests have been received from the employés for it. The adoption of vestibules involves increased expenditure, both in the first cost and maintenance charges, and in the opinion of the Committee the merits of vestibules depend largely upon local conditions. It has been found that, owing to the different arrangement of seats and widths of vehicles in the various towns, the weight of the car body per seat does not afford a reliable or fair comparison. The difference between the highest and the lowest weight per seat on the top deck of cars fitted with single trucks, contained in the replies to a questionnaire, was 48.3 lb., or 64 per cent. The difference in weight per seat of the lower saloon based on the seating capacity was 98.4 lb., or 26 per cent., while the highest and lowest weights of the electrical equipment of the car bodies, based on the total seating capacity of the cars, showed a difference of over 100 per cent. This difference in weight also applies to the weight per foot run based on overall length. The total weight for the car bodies showed that the difference between the highest and lowest weights was 1 ton 3 cwts., or 19 per cent. Of four undertakings which supplied particulars regarding the double-deck top-covered car fitted with bogie trucks, it was found that there was a considerable difference in the weight of the top-deck cover when based on the number of seats provided on the top deck. The difference between the highest and lowest weights per seat was 55.2 lb., or 73 per cent. The difference between the highest and lowest weights per seat for the lower saloon was 106.4 lb., or 43 per cent., and that between the highest and lowest weights per seat for the electrical equipment was 9.6 lb., or 77 per cent. The difference between the highest and lowest weights per seat for the total weight of the body, based on total seating capacity, was 40.5 lb., or 18 per cent.

In dealing with constructional details the Committee is unable to make any recommendation relating to specific reduction in the weight of car bodies, feeling that the designers of car bodies must, so far as types are concerned, be guided in their choice largely by the conditions under which the undertakings are operated, and the choice of general arrangement is one upon which there are different views.

It is recognised that in the construction of the main framework there is much scope for improvement in the present designs, and it is agreed that by introducing the system of flitching, not only is the weight reduced, but the structure strengthened. In many cases the question of the accommodation of passengers in excess of the seating capacity cannot be ignored. The provision of transverse seats with liberal spacing may involve a reduction in the seating capacity of the car, although for pleasure routes such seats are preferred by passengers. It is considered that the general standard of tramcar lighting is deficient and that full advantage of the facilities available for that purpose is not taken. Cars should be well lighted throughout so that passengers may be able to read ordinary newspaper print in comfort. The attractiveness of a well-lighted tramcar is beyond question

For the purpose of defining high and low speeds the Sub-committee on Trucks and Equipment decided to classify motors having a speed up to 700 r.p.m. as "low-speed" motors and all above that speed as "high-speed" motors. In view of the generally expressed opinion that it is desirable to reduce the weight of the tramcar, the necessity for lighter motors has been pressed. In response to this demand the manufacturers have produced the high-speed motor, which shows a considerable improvement in weight per h.p., as compared with the low-speed motor. The question of the general efficiency of the two types of motors was considered by the Committee, and from the evidence which it had before it, it is of the opinion that they are equally efficient electrically.

The advantages of the high-speed motor are:—Its decreased weight and size per h.p.; better road clearance, and more room in the truck for brake fittings; less dead weight; it enables a smaller wheel to be used where necessary or desirable.

The disadvantage of the high-speed motor is that it necessitates a higher ratio gearing, with an increase in the diameter of the gear-wheel, if the present standard tooth is retained.

A small-toothed gear is, therefore, a necessity, if a 32-in. wheel is used. Small-toothed gears for heavy traction service are undesirable with the present form of standard 14½ deg. involute tooth. It should, however, be possible to design a small tooth to meet the necessary requirements. Small-diameter car wheels assist in overcoming the difficulty of the large gear, as part of the reduction is gained in the size of the wheel.

The Committee recommends to manufacturers the desirability of producing a suitable improved reduction gear for use in connection with high-speed motors.

The question of motor design was considered by the Committee and it is satisfied that the present high- and low-speed traction motor is efficient and satisfactory. In connection with the mechanical part of the motor, it is of the opinion that the combined roller bearing, with the location ball bearings at one end, is the most satisfactory type. It is essential that an adequate seal should be embodied in the design of the housing for the exclusion of dust from, or the leakage of lubricant out of, the bearing.

This type of bearing is cheaper to maintain and is more satisfactory and reliable than the plain bearing, as it reduces the necessity for lubrication to a minimum, it maintains armature clearances, the gear registration is maintained, and the running costs are lower.

The question of motor suspension was considered and, in the opinion of the Committee, it demands special attention in view of its effect not only on the motor, but on the life of the axle, the gears and the track.

In this connection the following are the principal details affected: The actual life of the motor; every shock transmitted to the motor tends to loosen the windings, pulverise the insulation, loosen the brush gear, and damage the armature bearings: The registration of the gears and pinions; the wear on the suspension bearings alter the distance between the centres of the gear and pinion and the registration of the gears is thus affected, causing excessive wear and noise and inefficient

* The first article appeared in ELEC. REV., July 9th, 1926.

transmission: The life of the track is increased by decreasing the unsprung weight on the axle. The merits of hollow axles as a means of reducing unsprung weight and other methods of achieving that end have been considered, but the information available was so limited that no conclusion was arrived at.

The question of the light as compared with the heavy tramcar has been considered, but the Committee is unable to come to any decision thereon, in view of the widely-varying conditions obtaining on the systems throughout the country. It is of the opinion that it is desirable to keep the centre of gravity of the tramcar as low as possible and that it should not be increased beyond the present practice.

In view of the developments which are now taking place, the Committee thinks it premature to express any definite opinion at this stage on the subject of electrical control, but it is of opinion that the maximum capacity of the present drum and segment-type controller has been reached. With the advent of higher-power motors some form of contactor control adapted to tramway service is essential.

The question of the silent running of tramcars is one of the greatest importance. There are two classes of transit sounds, inherent and mechanical rattle. The principal cause of the first class is undoubtedly the contact of the steel wheel with the rail. Several attempts have been made to reduce this but so far the defects of the various designs have outweighed their advantages, and there is room for further research in this direction. With regard to mechanical rattle the Committee is forced to the conclusion that this is due to bad design, poor workmanship and, above all, to inefficient maintenance.

Investigation has established the fact that in the manufacture of gears there is a considerable lack of accuracy, and in practice it is found almost impossible to interchange gears of one manufacture with those of another. It is therefore recommended that steps should be taken to ensure the accurate production by all manufacturers of a standard tooth.

However accurate the original gears may be, the benefit obtained is quickly nullified if the bearings are allowed to become unduly worn, as it affects the meshing of the gears, thereby increasing the wear and materially shortening the life and making the gears noisy; and it is necessary to keep the wear within reasonably close limits, in order to maintain the correct registration of the gears.

The Committee recommends that, pending a decision by the B.E.S.A., no change be made in the form of teeth for tramway gearing.

It was found that in many cases attempts were made to silence the gears by the use of heavy grease, the quality and ingredients of which leave much to be desired. Gear lubrication should be oil, or a light grease which very nearly approaches oil.

Lack of care and poor maintenance of motor-suspension bearings are responsible for a considerable amount of noise and these bearings should be of hard bronze in preference to white metal. If efficient oil lubrication is adopted the average cost is considerably lower than any other form of bearing

Insufficient care has been bestowed on the design and maintenance of brake gears from the point of view of noise.

A considerable amount of noise is caused by the bad fitting of the motor-suspension bar springs, and it is recommended that the suspension bar should be rigidly fixed to the frame and some suitable form of spring suspension arranged between the bar and the motor itself, as it has been found that it is quite possible to suspend the motor by a simple arrangement so as to eliminate all noise on this account.

Discussion on the Report of the Rolling Stock Committee.

Mr. G. MARSHALL HARRISS (Dublin United Tramways Co.) remarked that the report seemed to emphasise the point that there was not sufficient standardisation in the tramway industry, but he hoped there would not be complete standardisation of tramcars as a whole because, owing to varying circumstances, this would not be practicable. In Dublin they had been developing by a process of evolution rather than by wholesale scrapping and he did not think they had lost much in doing so.

Mr. W. VINCENT EDWARDS (Hastings Tramways), referring to the question of unsprung weight, said some of the designs in the report seemed to be rather complicated. There was a device used many years ago, and made by the Walker Co. of America—Dick, Kerr & Co. at one time used it—by which the motors were so mounted that there was no dead weight of the motor on the axle. That went out of use, for some reason, probably patent questions were involved, but it seemed a pity that this device or similar ones were not mentioned in the report.

Captain MORLAND (Walsall Corporation Tramways) commented on the fact that the members of the Committee had carried out experiments at their own expense. One of the most necessary things in the improvement of tramcar equipment was a new type of controller and he himself had experimented on the lines of the dimming device for lighting used in theatres. This, however, resulted in considerable heat being generated when applied to a tramcar controller, but he hoped others would follow up this work. There was nothing in the report with regard to height and the use of small wheels, and apparently that point had not been dealt with, but it might be considered in future deliberations, because there was a general tendency to-day in favour of being seated low down. The present double-deck car looked a somewhat fearsome traffic instrument and if the height could be cut down it would add to its popularity. He recommended attention being paid to keeping dirt and grit out of the rails.

Councillor BAXTER objected to the height of cars being reduced as this would make them even more unhygienic than they were at present. Neither did he like the double-deck car, because by an addition of 5 ft. to the existing car it would be possible to accommodate the same number of passengers in a single deck car as is now carried in a double deck car and, at the same time, get quicker loading and unloading and much better ventilation. Air brakes should also be used to a greater extent.

Mr. W. JOHNSTONE (Brush Electrical Engineering Co.) expressed regret that manufacturers were not invited to sit on the Joint Committee, because they had considerable knowledge and experience which they would be pleased to pass on to the buyers. The reduction of weight was one of the most important points to be taken into consideration, and it was one which had received considerable attention in 'bus circles where the details had been gone into in a very careful manner.

Mr. R. S. PILCHER (manager, Edinburgh Corporation Tramways) said there was no reason why the top covering of a tramcar should not be much lighter than it usually was, and by the use of steel the weight could be reduced very considerably. In Edinburgh air brakes were being used in conjunction with the magnetic brake with most satisfactory results. There was practically no maintenance cost and it was to be recommended for service purposes. The disadvantage of cross seats as against longitudinal seats was that it meant the loss of at least six seats in the lower saloon of a double-deck tramcar, because standing was prohibited in Edinburgh. The double-deck car was popular enough in this country, and served its purpose very well. The report did not deal with jazzing, but that was a matter which might be taken up later.

Mr. E. H. EDWARDES (South Lancashire Tramways Co.) advocated longitudinal seating in preference to cross seats, because it allowed a greater seating capacity and facilitated the collection of fares. As to double-deck cars, the only people over here who did not like them were those who were too lazy to walk upstairs.

Mr. G. RATCLIFFE HULME (British Electric Traction Co.) said his experience in Canada led him to the conclusion that the single-deck car was used there for climatic reasons. The system of payment as you enter the car had a great use in the United States and Canada, and he would like to see it adopted here.

Col. S. E. SMITH said the only weakness in the report was the lack of recommendations on definite details, and it would have been useful if a definite specification had been drawn up of what the Committee regarded as the ideal tramcar. He had been taking a personal interest in this matter and had copied, more or less, the design of seating on an American motor car which he had been driving for some years, and had fitted really comfortable longitudinal seating in tramcars. Brakes were a matter not dealt with in the report to any extent, but there was need for brakes expanding in drums, although they were not easy to fit on tramcars. Then there was the use of ball bearings which ought to be fitted to armature and axle bearings.

Alderman A. RUDD (St. Helens) said St. Helens had already adopted tramcars where the passengers entered at one end and left at the other. Most of the noise of the tramcar was, he thought, due to bad track and this had been proved by the fact that at St. Helens a length of track had been laid since the war and the noise was very slight. As to the repair of the track, the difficulty found in St. Helens was that the repair of the track was in charge of the borough surveyor and the repairs were not taken in hand sufficiently quickly to keep the track good. In St. Helens they had solved the jazzing problem by the adoption of a single-axle radial truck. This had been fitted to a number of cars which the Department had re-conditioned and, by a patent brought out by the foreman of the shed, it was possible to get a 10-ft. wheelbase instead of the old 6-ft. or 7-ft. device. In this way it was possible, with the larger wheelbase, to get round the same curves as with the smaller wheelbase. As to reducing weight, this was possible, as was shown in a case at St. Helens, where a 56-seater tramcar only weighed 18 cwt., this being effected by the use of T irons on the top.

Mr. SPENCER, replying to the discussion, said that as the report was by a committee it was therefore something in the nature of a compromise. As to pay-as-you-enter cars, there was an essential difference between American and Canadian systems and ours, in that, they had a universal fare and there was no necessity to issue tickets. The passenger dropped his nickel into the box and passed to his seat. He would like to see something of the sort introduced here, but he did not think it would be found to be practicable, owing to the difference in conditions. The air brake was a very fine one, but he did not like the magnetic brake, although it was due to the magnetic brake that the higher average speeds were possible on the London tramcars: but he was experimenting with a combination air brake which he believed would give practically the same result. He personally would like to have had some manufacturers on the Joint Committee, but the difficulty was that it would have been necessary to have had all the manufacturers represented. Perhaps later on it would be possible to arrange for agreed representatives of the manufacturers as a whole to act. He challenged any suggestion that our tramway managers were an indolent, conservative and back-number class. There was certainly plenty of scope for reducing the weight of tramcar bodies and there was no reason why it should not be done. There were, of course, certain fundamentals which could be standardised, but there would always continue to be diversity of design according to local conditions.

The Annual Dinner.

The annual dinner of the Association was held on the Friday evening at the Grand Hotel, the members being entertained by the Board of the Torquay Tramways Co. Mr. H. T. Barnett, chairman of the directors, presided. After the loyal toast, the chairman proposed "The Torquay Corporation," coupling with it the names of the Mayor of Torquay, Commander Williams, M.P. for the district, Mr. C. J. Spencer and Mr. P. Priestly.

Mr. SPENCER, after some references to the beauties of Torquay, said he would not like to miss taking advantage of the opportunity offered by the presence of Commander Williams to impress upon him the difficulties which the tramway industry was suffering under to-day. Although it had been said that it was not the business of Parliament to interfere in industry—and rightly so—yet it was the business of Parliament to see that the game was played. To-day, the tramway industry was operating under an obsolete Act of Parliament, the Act of 1870, and the tramway companies were compelled under this Act to maintain not only the space between the rails, but also a distance of 18 in. outside. Surely it was time for the Government to realise the need for an amendment of that Act. Tramway undertakings were required to maintain these tracks, at whatever expense, and they were compelled to carry about 20 per cent. of their traffic at something like half fares, conditions imposed at a time when it was considered that electric tramways had a monopoly of street transport. All that had changed, however, and motor-'buses now could get licences to run where they pleased and how they pleased, and they used the tramway tracks which had to be maintained by the tramway undertakings. Large sums of money had been invested on the strength of the Parliamentary powers originally granted. Ultimately, this competition would have to go because it was no more possible to have competition in street transport than it was to have competition in water, gas, or electricity supply, or in any of the great public utilities which were so necessary to the community. Therefore, a time would come by a process of evolution when competition of this nature would vanish and it would be necessary for Parliament to see in what way it could regulate matters so that the public would be adequately served. He suggested that now was the time for Parliament to take action in this vital matter because we were driving into a chaotic condition for which the public would ultimately have to pay.

Mr. P. PRIESTLY (President of the Municipal Tramways Association) endorsed all that Mr. Spencer had said with regard to what the Government ought to do concerning tramways; the Government must do something to help the tramways over the difficult time through which they were passing, and to place the position as between 'buses and tramways on an equitable basis.

Mr. W. B. COWNIE, managing director of the Torquay Tramways Co., responding to the toast of the Company, proposed by Mr. C. G. Tegetmeier, said the Government would be doing more good by amending the 1870 Act than by passing the Electricity Bill, which he believed would do great damage to electricity undertakings in this country, because they were holding out hopes to the rural districts of electricity at a penny per kWh when there was no chance of any of the districts getting electricity at 1s. per kWh.

The Electricity (Supply) Bill.

The Proceedings in Committee.

(*Continued from page 79.*)

STANDING Committee C. of the House of Commons continued its discussion of the Electricity (Supply) Bill on July 5th. Sir Robert Sanders presided.

Clause 21 deals with the power of the Central Board to purchase surplus electricity.

Sir J. MARRIOTT (York, U.) moved an amendment with the object of giving the Electricity Commissioners power to authorise any undertakers to lay mains which are outside the authorised undertakers' areas of supply, for the purpose of conveying electricity obtained from waste heat, water power, and so on.

Sir D. HOGG, the Attorney-General, opposed the amendment, stating that it would be outside the meaning or intention of the Bill to introduce into the clause generating stations which were non-selected and which had nothing to do with the Board.

The amendment was negatived.

An amendment moved by Mr. HARDIE (Glasgow, Springburn, Lab.), to enable local authorities with surplus power to dispose of it to the Board, was agreed to.

Sir J. NALL (Manchester, Hulme, U.) moved an amendment to provide that the Board should not exercise the powers given by the Clause within the area of supply of any authorised undertakers except with the consent of those undertakers. He said that the intention of the amendment was that the Board should not compete with authorised undertakers in their own areas.

Sir D. HOGG said that the restriction proposed was hardly a reasonable one to place on the Board. The Clause provided that the Board might purchase surplus electricity by agreement with those who sold it. There could be no possible reason why, if the Board decided to make an agreement under which surplus electricity was sold to the Board, it should not automatically come under the arrangements of supply on a tariff or cost price to persons supplying. There was no reason why undertakers should have the right of veto in their area.

The amendment was negatived, as was also an amendment moved by Mr. ATTLEE (Limehouse, Lab.) to lay down the principle that the Board should not exercise any of the powers given in the Clause in the district of a joint electricity authority without the consent of that authority.

Clause 21, as amended, was then agreed to.

Clause 22 deals with the annual report that the Central Electricity Board shall make to the Minister of Transport, and the Committee agreed to an amendment, moved by Mr. GOSLING (Whitechapel, Lab.), ensuring that any such report should be laid before both Houses of Parliament.

Clause 22, as amended, was agreed to.

On Clause 23, which deals with the expenses of the Board, Sir P. DAWSON (Lewisham, E., U.) moved that there should be a repayment to the Electricity Commissioners of any expenses incurred by them in the preparation of any schemes under the Bill. The amendment was agreed to.

Sir J. MARRIOTT moved the addition of the following subsection :—"(2) The interest and sinking fund charges in respect of any money borrowed by the Board for the payment of expenses incurred in effecting standardisation of frequency in pursuance of this Act shall be repayable to the Board by the Electricity Commissioners, and the sums so payable by the Electricity Commissioners shall be treated as part of their expenses, but shall be shown as a separate item in their accounts and in the demands for contributions made by them."

Lt.-Col. MOORE-BRABAZON, Parliamentary Secretary to the Ministry of Transport, said that the amendment was of a very wide character, and it needed consideration because it presupposed that everybody throughout the whole country should pay towards standardisation, but a case might be made out that those who did not benefit from standardisation should not be compelled to pay for those who did. The Government did not resist that change, but would like to consider the matter.

After a lengthy discussion, Sir D. HOGG proposed to go into the matter before the report stage, and Sir J. Marriott withdrew his amendment.

Clause 23, as amended, was agreed to, and the Committee adjourned.

On July 6th, on Clause 24, which deals with the borrowing powers of the Board, Sir J. NALL moved to delete words which would permit the Board to capitalise interest on capital expenditure which is unremunerative for a period of years, such period to be determined by the Electricity Commissioners after consultation with the Treasury.

Sir D. HOGG, in resisting the amendment, said its only result would be to hamper the Board. The object of the Clause was to provide that interest might be capitalised for such a period as was necessary for expenditure to become fruitful. Such a provision was commonly found in private Acts of Parliament, and the words in the Clause were actually copied from the Act of 1922, by which similar power was given to the joint electricity authorities. There would be a check on this operation, because Treasury control would be preserved.

The amendment was negatived.

The Clause limits the borrowing powers of the Board to £33,500,000, unless further borrowing is authorised by a special order under section 26 of the 1919 Act. Sir J. NALL moved to limit the borrowing powers strictly to £33,500,000.

Sir D. HOGG contended that the Special Order would have to be made by the Commissioners, and then go to the Minister of Transport for his approval, and finally each House of Parliament would have to pass a resolution approving the Order before it would have any force. That was an efficient check and safeguard.

The amendment was negatived and the Clause agreed to, as was Clause 25, which gives power to authorise the issue of stock.

Clause 26 gives power to the Treasury to guarantee loans to the Board, and an interesting discussion arose on an amendment moved by Col. BURTON (Sudbury, U.) in the following terms :—" Provided that no part of the moneys secured by the above-mentioned guarantees shall be expended on plant or machinery which has not been manufactured in the United Kingdom or the British Empire."

Col. ASHLEY, the Minister of Transport, was in sympathy with the amendment, but said that it would be very difficult to carry it into practice. To show the practical difficulties, he quoted a recent instance in which the Edinburgh Corporation

found that the lowest British tender for electrical plant was £190,000, as against a tender of £138,000 of a Swiss firm. With great reluctance, being a patriotic Corporation, it had to give the order to the foreign firm, for the difference was so great that it could not ask the ratepayers to bear the additional burden. Unless the power was retained to import foreign stuff they might be at the mercy of "rings."

Mr. ATTLEE, on behalf of the Labour Party, opposed the amendment. He contended that the electrical industry was most highly organised in the matter of fixing prices, and Limehouse had been forced to accept foreign tenders, because, when it asked for British tenders for cable, all the tenders were exactly the same. He was in favour of keeping all the work possible in this country, but the Electricity Board would have to deal with public money, much of which would have to be spent on cable, and the "cable ring" was one of the strongest in the country.

Major GLYN (Abingdon, U.) suggested the fixing of a sliding scale so that as profits rose the price of the article should come down.

Sir P. DAWSON said the amendment would not be fair to the Board, but the amount of money spent by the Board on electrical plant would be very small. The money would be for overhead transmission lines (bare copper or aluminium wire and steel masts) and the cost would not be so much that of the material as of the labour connected with it.

The amendment was rejected by 24 votes to 14.

On the question that Clause 26 be agreed to, Mr. RADFORD (Salford, S., U.) moved its omission on the ground that the Government guarantee of £33,500,000 was a subsidy.

Sir D. HOGG said that the scheme had the approval of the Chancellor of the Exchequer.

The Clause was agreed to by 36 to 14, and the Committee adjourned.

On July 8th, the Committee began the consideration of Clause 27, which provides that the accounts of the Electricity Board should be audited under the regulations of the Ministry of Transport.

Sir J. MARRIOTT moved that the accounts should be audited by the Comptroller and Auditor-General as public accounts in accordance with such regulations as the Treasury might make and should be laid before Parliament with a report thereon.

Sir D. HOGG could not accept the amendment, saying that the Comptroller and Auditor-General was exclusively concerned with public accounts. The Clause, as drafted, followed the usual practice in the matter of auditing electricity accounts.

The amendment was negatived and the Clause agreed to.

On Clause 28, which deals with charges for electricity supplied by power companies, Sir D. HOGG moved an amendment that the Minister of Transport, in revising maximum prices chargeable by a power company which took electricity from the Board, should have regard to any change in the cost of electricity attributable to the Act. The amendment was agreed to, and the Clause, as amended, was agreed to.

Clause 29 provides that in the case of authorised undertakers (apart from power companies) the Electricity Commissioners may make orders as to the relation between charges for electricity and dividends to be paid by the companies.

Sir D. HOGG moved the insertion of a proviso that, in the case of a company carrying on two or more separate undertakings, any order made should regulate the charges for each undertaking "in relation to the divisable profits on the capital employed in that undertaking."

The amendment was agreed to, but some slight modification was foreshadowed in the report stage. Clause 29, as amended, was agreed to.

Clause 30 proposes to give power to authorised undertakers to require the lopping of trees which obstruct or interfere with the working of main transmission lines or other electric lines. Sir D. NEWTON (Cambridge, U.) moved to include hedges within the scope of this Clause, but Sir D. HOGG said that, when the proper time came, he would move a new Clause to deal with this. The amendment was therefore withdrawn and Clause 30 was deleted.

Clause 31 (schemes for the construction of electricity districts and the organisation of supply therein), 32 (contents of schemes), and 33 (amendment of schemes) were agreed to. On Clause 34 (provision as to companies with large areas of supply), Lt.-Col. Moore-Brabazon promised on report to insert words to make it clear what a "large area" was. The Clause was then agreed to and the Committee adjourned.

(To be continued.)

Glasgow Refuse-Disposal Works.—Messrs. Heenan and Froude, Ltd., contractors for new refuse disposal works at Govan for Glasgow Corporation, have submitted a plan of the power station. This provides for two 5,000-kW, 50-cycle turbo-alternators complete with auxiliaries, and two, or alternatively three, 3,750-kW frequency changers, six main step-up transformers, and the necessary switchgear, &c. They state that the effect of providing the additional accommodation required is to increase the building area by over 100 per cent., the change being necessitated by the alteration of the original specification from a 25-cycle to a 50-cycle plant, and that their provisional estimate of the approximate increase in cost over their contract price for the whole of the extra work involved is £52,000.

Metal-Clad Switchgear.

Another Ferguson, Pailin Design for Super-power Stations.

THE example of super-power station switchgear illustrated below has a rated breaking capacity of 1,500,000 kVA, and has been designed for systems with up to 33,000 volts between phases, at which pressure the switch has a maximum current-carrying capacity of 1,200 amps., increasing to 3,000 amps. at 11,000 volts.

The following features are said to be unique:—Two separate 3-phase circuit breakers may be utilised on each circuit, an arrangement which is almost universal practice in U.S.A., and facilitates busbar selection, provides a second line of defence, and enables the circuit to be maintained whilst one breaker is being inspected or overhauled. Alternatively, a single 3-phase breaker with a mechanical rack-over device may be installed, the second breaker being fitted subsequently if desired.

The busbar and connection chambers are designed so that either solid compound, liquid compound, or mineral oil can be used for insulating purposes, and a separate motor-operated raising and lowering device is provided for each breaker. Each phase is completely metal-enclosed throughout, so that it renders possible the provision of a separate switch room for each phase. This system improves the scheme of busbar selection and the whole of the circuits can be changed over from one set of bars to the other without breaking load. Normally interlocking prevents the two breakers being closed on to the two sets of busbars at the same time; this feature may, however, be removed by means of a padlocked-switch on the control board. The scheme enables the fullest use to be made of the auxiliary busbars, *e.g.*, facilitating supplies from interconnected generating stations being received and distributed without running in parallel; the testing of doubtful feeders on a separate machine; or obtaining a voltage boost on particular feeders.

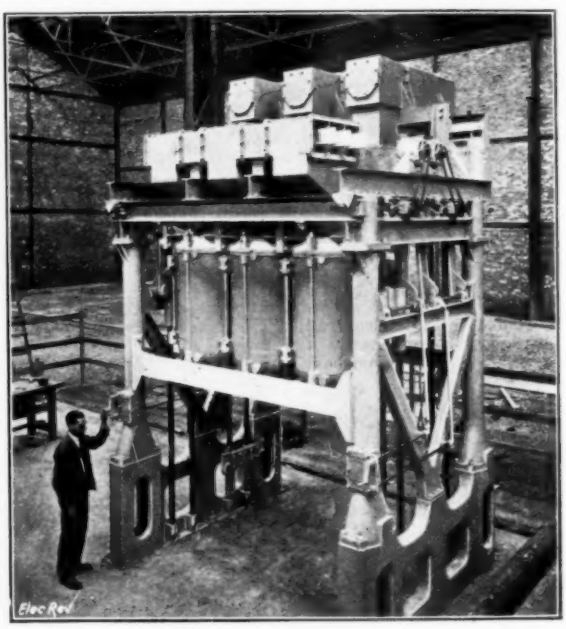


Fig 1.—Heavy-duty Ferguson, Pailin Switchgear.

When it is required to transfer a circuit from one set of bars to the other (if one breaker only has been provided) it may be lowered to the isolated position, racked across to the other set of bars, and then raised to the operating position, whilst the following advantages are claimed for the vertical isolating principle:—Considerable space economy; the connections are more direct and contain less joints; the total number of insulators required is reduced; there are greater facilities for handling the breaker, and the gear is drip proof.

The gear is completely interlocked and phase separation is also applied to the oil circuit breakers. Each of the two triple-pole breakers has a separate dome-shaped top plate and tank for each phase, the three units being securely bolted together. The tanks are cylindrical in shape with a spheroidal base, made of cast electric steel. Emergency hand-operated raising and lowering mechanism is also provided and the oil tanks are permanently fitted with wheels, thus obviating the necessity for a tank carriage. The venting arrangements are baffled and a separator allows the gases to escape, but returns ejected oil to the tank when the pressure has subsided.

For the higher-voltage units all bushings are of the condenser type and standard "V"-bar and finger contacts are employed. The current transformers are accommodated in separate chambers on the fixed portion of the unit, filled with oil or liquid compound; the oil-immersed potential transformers with their fuses and current-limiting resistances are mounted on trucks running on rails and arranged to plug on to the circuit side of the units.

The Royal Agricultural Show.

The Second British Electro-Farming Conference.

READING, the Berkshire capital, became the centre of British agricultural interest when the 85th annual show of the Royal Agricultural Society opened there on July 6th, the exhibits covering some 150 acres.

Amongst the meetings held in connection with the show, the second British Electro-farming Conference took place on July 8th, under the auspices of the British Electrical Development Association. Mr. Ll. B. Atkinson occupied the chair, whilst the speakers were Mr. C. T. Allan, who chose "Electric Power for the Farmer" as his subject, and Mr. R. Borlase Matthews, who dealt with the "Economic Use of Electric Light on the Farm, with particular reference to Poultry Keeping."

Electric Power on the Farm.

Mr. C. T. ALLAN, in the course of his remarks, explained that at the Royal Agricultural Society's 1919 show in Cardiff, the first after the war and the first of its kind to include an electrical exhibit, there was such a large attendance that the police had to guide the people. As a result of what was shown there, there had been a very great desire on the part of farmers in South Wales to have electricity, and in this connection he urged farmers to look favourably upon applications for wayleaves to run pole lines over their property. Although there had been some development in South Wales, the examples were on the small side, but the general experience was that so soon as a farmer got electricity for lighting he immediately installed a motor for chaff cutting, pulping, &c.

After giving instances of what a kWh of electricity would do in small power operations, Mr. Allan said it was remarkable what a small 2- or 3-h.p. motor (costing £25) would do. In one special case a farmer installed a small motor for chaff cutting, which operation had previously cost him £65 a year in labourer's wages; he was now able to do three times the amount of work he used to, because he also did work for his neighbours and made money in that way, and yet his total bill for electricity (at 2½d. per kWh) was only 36s. Considerable development was possible in electro-culture, and, of course, in the house; small power could be applied by means of a portable motor on a trestle, plugged in as desired, and undoubtedly such uses led to more extended uses for which individual motors were required. The farmer's wife particularly appreciated the labour saving which the various household uses of electricity made possible, particularly the washing machine. At the same time, the cost of this device was too high, and could be reduced to £5 by mass production. As regarded the vacuum cleaner, it was not generally known that this was also the finest fly-catcher available; if a rubber pipe was attached to the suction end and run round the windows and walls of the dairy, or any other place, flies, wasps, and bluebottles were sucked in at once. As to radiators, if a fan was placed near one of these in cold weather it had a wonderful effect in increasing the temperature of a room by circulating warm air quickly. Finally, Mr. Allan referred to the "Sunray" lamp for heating conservatories and greenhouses. This, he said, was a type of radiator which gave out radiant heat, similar to the sun, and he believed great use would be made of it.

Electric Light on the Farm.

In the course of his paper, Mr. MATTHEWS pointed out, *inter alia*, that it was seldom disputed that electricity was needful for the comfort of every home, but the fact that only about 20 per cent. of the houses in this country were electrically lighted was not often realised. The explanation of that low figure was, in part, accounted for by the lack of facilities offered to rural dwellers, and, in part, by want of appreciation on the part of many people that every householder *could* afford it; in fact, there were very few who could afford to be *without* it, and the farmer was certainly not among the latter.

The use of electric light on the poultry section of the farm, for the stimulation of egg production during the winter months, was a very practical and profitable application of electric light on the farm which had passed the experimental stage; the majority of the poultry farms in America were electrically lighted, while most of the larger commercial poultry farms in England were now producing increased supplies of winter eggs in this way. Careful records had been kept on the author's farm, and had shown that the total cost of the electric light for the whole period amounted to about the average price of one egg per hen per annum; or, in other words, a kWh of electricity would provide light for 100 birds for three days.

For testing the fertility of eggs in an incubator, there was nothing like "candling" them with a powerful electric lamp. An entirely new application of electric lamps was to prevent the crowding of young birds together at the side of a cold brooder house, by suspending a lamp in the centre near the floor. The good result thus obtained was due to the fact that the lamp and its slight warmth attracted and kept the birds in the middle of the building.

Another interesting application of electricity on the poultry farm was to be found in the use of ultra-violet rays; while few experiments had been carried out so far in this country, sufficient had been done in other countries to show that there were far-reaching possibilities in this direction. The lamps generally used were either arc or quartz mercury-vapour lamps, the light of which contained about 28 per cent. ultra-violet rays, which was four times more ultra-violet light than was radiated by the sun.

Young chicks under this treatment for 20 minutes each day for two months attained the size of three-months-old birds and were ready for the market at least five weeks before untreated chicks. The death rate among treated chicks was reduced by more than 50 per cent., while weak legs and rickets were entirely eliminated.

Experiments had also been conducted to determine the effect of ultra-violet light on laying hens, and it had been found in one case that hens given a ten-minute ultra-violet radiation daily during the winter months laid 140 per cent. more eggs than untreated birds in a control pen. The exposure of any bird to ultra-violet light, whatever its age, should not exceed 20 minutes per day, and should be started with about 10 minutes.

Discussion.

Mr. LL. B. ATKINSON, chairman, said the two opening speakers had covered the smaller uses of electricity on the farm, but those who were interested in the whole problem realised that it was necessary also to study the larger applications of electricity for ploughing and cultivation, because it was the large applications which would be the inducement to the supply authorities to bring electricity to the farms. Mr. McDowell had been giving a great deal of attention to this subject.

Mr. C. D. MCDOWELL expressed the view that it would be necessary to deal with the larger applications of electricity on the farm before there would be a full development of the smaller uses. He was within two miles of a supply of electricity, and would at once adopt electric ploughing if a successful machine was available at a suitable price. Until such apparatus was developed on economic lines, however, he could not imagine much progress being made with rural electrification, for the simple reason that it would not be economic to take electricity into the rural areas merely for lighting and the small power load. It was little use speaking to the farmer of apparatus that would save a pound or two; it was a question of saving the farmer hundreds of pounds before electricity on the farm would receive the attention it deserved. Personally, he was convinced that electric ploughing was a practical and economic problem if tackled on the right lines. The only thing the farmer could look for to help him now was cheap electricity, because the Government would not give protection or subsidies, but it was of no use giving the British farmer cheap electricity unless he had the means for its efficient use. A great deal was said by the Government as to the need for research, and considerable sums of money were being spent (quite rightly) in this direction. At the same time, he could not help thinking that it would be wise to spend a little of that money upon evolving suitable types of apparatus so that the heavier operations on the farm could be done electrically. At the moment big losses were being incurred upon arable farming, and those losses had to be made up by dairy and sheep farming; yet arable farming was one of the greatest assets the country had, because it produced food and employed labour. The whole trouble was that farmers to-day were using tools which their great-grandfathers used, yet it was necessary to increase output and cheapen cost if progress was to be made. Electric power made that possible, but it was extremely difficult to get new ideas taken up. For instance, after a great deal of thought, he had come to the conclusion that it was possible to plough and cultivate by electrical means, but when he went to some engineers in London and asked for their assistance, he was told it could not be done. Then he went to some of the electrical manufacturing firms, and they said they did not know much about it, but they thought it could be done. Eventually, he induced some of them to lend him various pieces of apparatus, such as a motor, some cable, and so on, and he himself fitted up a machine which looked a little awkward and crude in some respects, but it did have built into it the principles which he had contended all along were right, although some people disagreed. He had made that machine work,* and it had since been recommended for development by the Government Department concerned. He had spent all he could afford on the problem, and it was now up to other people, either to produce a new design, or develop the one he had demonstrated. The farmer was, naturally, very suspicious, and unless he had fool-proof machines which required no skilled knowledge to look after them, little progress would be made. The paraffin motor was the reverse of that. Incidentally, Mr. Matthews had spoken of one kWh of electricity being equal to a gallon of paraffin. Whilst for lighting on the farm not more than two gallons of paraffin would be used a week, in his own case he used 80 gallons a week for tractors, and if, instead

* See ELECTRICAL REVIEW, July 2nd, 1926. p. 4.

of having to pay, say, 1s. per gallon for paraffin he could get electricity at 2½d. per kWh to do the work of each gallon of paraffin, huge savings were possible.

Mr. W. A. TURNBULL (Borough Electrical Engineer, Aylesbury) said he was doing all he could to make electricity on the farm a practical proposition for the farmer in the Aylesbury area. A scheme was being developed there covering practically 250 square miles of agricultural land as a business proposition. At the moment he was concentrating on connecting the large houses and villages, and then the farms would become the all-important item. His scheme was to provide an electric iron free and to hire out cookers at 3s. 9d. per quarter, and vacuum cleaners at 1s. 6d. per day. It was no use trying to rush the farmer, however; development would have to be gradual. At the moment he was concentrating on the small uses and hoped to be ready in about 18 months time to study the larger uses, such as ploughing. He hoped, however, to still further reduce the cost of overhead lines—his lowest at present was about £300 per mile—by using high-tensile steel, covered with copper.

Mr. H. T. YOUNG, asked by the Chairman for his experience in connection with isolated electrical plant on farms, said he had found that, owing to the capital cost of the battery, in such cases people never went beyond lighting and the use of very small apparatus. Such was the psychology of the farmer, however, that as soon as one went in for a new thing all others would want to follow, and that gave some point to the suggestion of Mr. Turnbull that every effort, at this stage, should be made to get examples in the various districts.

Mr. W. C. BROWN, a Lincolnshire farmer, said there was the prospect of a 6,600-volt line passing his farm in the future, but presumably he would have to provide the transformer. At present he was using an 8-h.p. (nominal) steam engine. Various questions asked by him were replied to by Mr. Turnbull and Mr. Matthews, while Mr. WILLIAM GILBERT (Ransomes, Sims & Jefferies, Ltd.) said his firm made a 4-ft. threshing machine running on ball bearings which required a 10-h.p. motor only, and there was a larger size requiring a 20-h.p. motor.

Mr. MATTHEWS, referring to intensive lighting, said he had carried out a check experiment with a water bath to absorb the heat rays, and the result had demonstrated that the light, as well as the heat, played a part in stimulating the growth of plants.

The CHAIRMAN, proposing a vote of thanks, said it was a little astonishing that so few people at a show like that—farmers as well as manufacturers—should have felt sufficiently interested to attend the meeting. As a matter of fact, other meetings at the show had been even worse attended, and probably the fine weather was partly responsible. The point was that in the show was a lot of very valuable machinery for arable farming on which most people lost money. In electricity, however, they had a means of turning the scale, but there was yet a lot of pioneer work to be done. He and others interested in farming and electricity believed that the next great move by the electrical industry would be in the farms and rural areas. The towns had been pretty thoroughly dealt with, and the next move was to get the heavier applications of electricity to ploughing and cultivation.

Some Exhibits.

In the machinery section of the show Messrs. Petters, Ltd., had a representative selection of their oil engines and lighting plant made in two types—"M" engines, which work on petrol or paraffin with magneto ignition, and the "S"-type engines, which work on a wide range of crude oils or paraffin, with surface ignition. Their feature is the 2-stroke cycle which eliminates valves.

Besides agricultural implements, Messrs. Blackstone & Co., Ltd., exhibited "spring-injection," cold-starting, heavy-fuel engines, and both stationary and portable patterns of the 5-b.h.p., water-cooled, 4-stroke petrol engine, which is suitable for driving an electricity generator.

Messrs. Ruston & Hornsby, Ltd., in addition to pumps and farm machinery, also had several types of internal-combustion engines on view suitable for driving electricity generators, &c. A class "IP," 7-b.h.p., petrol-paraffin engine was shown coupled direct to a Ransomes dynamo.

The Electrical Imports of Chile.

THE following figures, showing the values of the imports of electrical and allied goods into Chile in 1924 are taken from the recently published official trade returns. For purposes of comparison the figures for 1923 are given, and notes of increases or decreases are made:—

	1923. Pesos.	1924. Pesos.	Inc. or dec. Pesos.
Insulators for telegraphs and telephones—			
Total	346,000	328,000	− 18,000
From United States	116,000	154,000	+ 38,000
,, Gt. Britain	99,000	64,000	− 35,000
,, Germany	130,000	104,000	− 26,000
Wire, insulated or sheathed (covered)—			
Total	545,000	448,000	− 97,000
From Germany	332,000	256,000	− 76,000
,, United States	120,000	105,000	− 15,000
,, Belgium	29,000	2,000	− 27,000
,, Gt. Britain	38,000	63,000	+ 25,000
Incandescent electric lamp bulbs—			
Total	983,000	594,000	−389,000
From Germany	464,000	235,000	−229,000
,, United States	231,000	140,000	− 91,000
,, Holland	229,000	170,000	− 59,000
,, Gt. Britain	27,000	34,000	+ 7,000
Apparatus (various) for electric lighting—			
Total	874,000	957,000	+ 83,000
From United States	242,000	558,000	+316,000
,, Gt. Britain	139,000	44,000	− 95,000
,, Germany	438,000	338,000	−100,000
Telephone apparatus—			
Total	338,000	622,000	+284,000
From Gt. Britain	111,000	327,000	+216,000
,, Germany	66,000	101,000	+ 35,000
,, Belgium	—	11,000	+ 11,000
,, United States	86,000	159,000	+ 73,000
,, Sweden	45,000	19,000	− 26,000
Telegraph apparatus—			
Total	114,000	102,000	− 12,000
From Germany	25,000	29,000	+ 4,000
,, Argentina	1,000	4,000	+ 3,000
,, United States	29,000	38,000	+ 9,000
,, Gt. Britain	27,000	27,000	—
Wireless apparatus—			
Total	123,000	541,000	+418,000
From Gt. Britain	7,000	16,000	+ 9,000
,, Germany	15,000	25,000	+ 10,000
,, United States	65,000	458,000	+393,000
Electric cables—			
Total	1,328,000	1,621,000	+293,000
From Germany	162,000	307,000	+145,000
,, United States	701,000	905,000	+204,000
,, Gt. Britain	457,000	407,000	− 50,000
Electric bells and parts thereof—			
Total	18,000	8,000	− 10,000
From Germany	15,000	4,000	− 11,000
,, United States	1,000	2,000	+ 1,000
,, Gt. Britain	1,000	—	− 1,000
Pipes and tubes, insulated for electrical purposes—			
Total	58,000	74,000	+ 16,000
From Germany	53,000	71,000	+ 18,000
,, United States	2,000	—	− 2,000
,, Gt. Britain	1,000	1,000	—
Carbons for electrical purposes—			
Total	50,000	44,000	− 6,000
From United States	12,000	23,000	+ 11,000
,, Gt. Britain	30,000	17,000	− 13,000
,, Germany	5,000	4,000	− 1,000
Dynamos, motors and parts thereof—			
Total	1,998,000	2,572,000	+574,000
From Germany	1,103,000	829,000	−274,000
,, United States	257,000	848,000	+591,000
,, Gt. Britain	—	827,000	+827,000
,, France	19,000	12,000	− 7,000
Electric lamps (other than incandescent bulbs)—			
Total	120,000	169,000	+ 49,000
From Germany	89,000	86,000	− 3,000
,, United States	17,000	59,000	+ 42,000
,, France	6,000	14,000	+ 8,000
,, Gt. Britain	3,000	3,000	—
,, Holland	1,000	1,000	—
Meters—			
Total	203,000	270,000	+ 67,000
From Germany	78,000	43,000	− 35,000
,, United States	46,000	24,000	− 22,000
,, France	7,000	—	− 7,000
,, Gt. Britain	69,000	152,000	+ 83,000
Cells and accumulators—			
Total	442,000	375,000	− 67,000
From Germany	100,000	84,000	− 16,000
,, United States	176,000	188,000	+ 12,000
,, Gt. Britain	132,000	82,000	− 50,000
Posts for supporting electric wires and cables—			
Total	65,000	55,000	− 10,000
From United States	31,000	39,000	+ 8,000
,, Gt. Britain	32,000	16,000	− 16,000
,, Germany	1,000	—	+ 1,000
Electric fans—			
Total	30,000	9,000	− 21,000
From Germany	25,000	3,000	− 22,000
,, United States	5,000	1,000	− 4,000
Electrical machinery, apparatus and parts (unspecified)—			
Total	3,214,000	3,530,000	+316,000
From United States	1,767,000	1,778,000	+ 11,000
,, Germany	561,000	1,085,000	+524,000
,, Gt. Britain	744,000	344,000	−400,000

[Peso = 1s. 6d.]

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

A New Welding Electrode.

A new metal alloy, "Elkonite," which promises to be of great value in electric spot welding, has been produced by the ELKON WORKS, INC., Weehawken, New Jersey, U.S.A. It is a copper-tungsten alloy from which welding electrode dies are being made. One of the limiting features in many resistance- or spot-welding operations has always been the copper electrode used, the pure copper not being hard enough when used under the high pressures at heavy currents common to this type of welding. Usually, after a few welds have been made, the surface of the copper electrode in contact with the weld becomes hot enough to anneal the copper, thus making it very soft. As a result, the copper tip rolls and mushrooms over the edges, giving a larger spot weld, which changes the current density, and, consequently, the quality of the weld. Copper-tungsten has a hardness of 225 (Brinnell), as compared with 82 for hard copper and 30 for soft copper, and its compressive strength is 208,000 lb. per sq. in., as against 58,000 lb. per sq. in. for hard copper. The alloy does not anneal at red heat; thus there is no soft surface metal to mushroom when used in welding. It has not been found necessary to form the entire electrode point or die of copper-tungsten, but rather to use inserts of the alloy at the electrode tip, the remainder of the die being made of copper as before. It is particularly adapted for use under severe conditions to which copper will not stand up, such as hot-upsetting rivets electrically, and in facings for clamps for rod welding. The durability of the new alloy is shown by a recent test, where the number of welds made with one dressing of a copper die averaged ten, while the first test using copper-tungsten inserts gave more than 1,000 welds with the die still in good condition at the end of the test. Fig. 1 shows a selection of copper-tungsten dies, and figs. 2 and 3 shows a comparison between spot welds made with copper points and some made with copper-tungsten points. The die points are shown in each case before and after using.

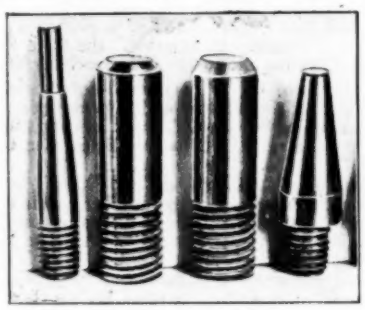


Fig. 1.—Copper Tungsten Dies.

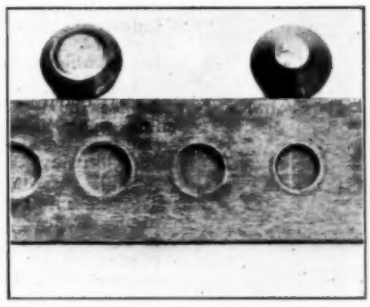


Fig. 2.—Copper Welds.

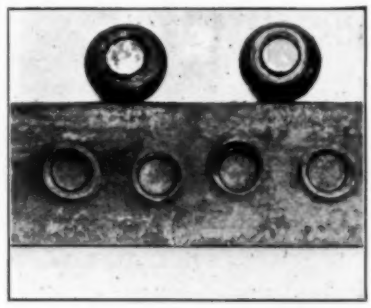


Fig. 3.—Copper Tungsten Welds.

A New Oil Engine.

What is claimed to offer advantages over the semi-Diesel engine, including higher speed, is the new gas-oil fuel type of engine, fig. 4, which has been produced by the PARSONS MOTOR CO., LTD., Town Quay Works, Southampton. It is of the enclosed, vertical, moderate-speed, continuous-duty type, and consumes ordinary gas oil of about 170-180 flashpoint and 0.86 s.g. The fuel is fed through the ordinary constant-level device, no fuel pumps or valves being employed. The engine is governed by a self-proportioning throttle, very close limits being obtained, it is claimed, by means of an enclosed high-speed governor. Starting is effected by hand, on a little spirit, and when starting cold the engine is run for a few minutes on petrol as is the ordinary paraffin engine. The engine is constructed with two standard sizes of cylinders only, 4¼-in. and 6¼-in., and the engine capacity varies according to the number of cylinders. With the small cylinder the engine is made in 2-, 3-, 4-, 6-, and 8-cylinder sets, the respective h.p.'s being 11, 16, 22, 32, and 44. Engines of 45, 67, and 90 h.p. are made with the larger cylinders as 4-, 6-, and 8-cylinder machines.

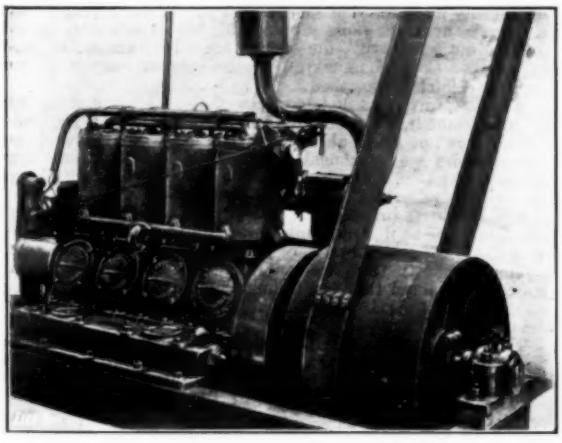


Fig. 4.—A New Oil Engine.

An Automatic Electric Boiler.

An interesting automatic electric water boiler, the Rothway, figs. 5 and 6, has been introduced by MESSRS. WM. BRIERLEY, COLLIER & HARTLEY, LTD., Sentinel House, Southampton Row, London, W.C.1. It is a suitable apparatus for installation in such places as institutions, hospitals, and ships, and is claimed to be foolproof; a thermostat device controls the heating elements between suitable limits of temperature, and the water inlet is automatically operated in conjunction with the draw-off. Fig. 5 represents the principle of the working. Cold water enters at A and passes to control valve B and along the pipe C to the thermostat chamber D. It then falls by gravity down pipe E and enters the lower end of boiler. The cold water supply is controlled by simultaneous action with the draw-off tap G by means of the connecting link H. The immersion heaters, L, M and N, must be completely immersed before any water will flow from the draw-off tap G, and the water level is maintained by the position of G and controlled by the regulator P. All the water drawn off must first pass into the final heating chamber F, through the small ports XX—XX. As the cold water passes up the pipe C it flows round the thermostat in chamber D, which automatically operates the contactor switch from the control box K, and brings into circuit any pre-determined loadings on the immersion heaters. These remain in circuit until the desired temperature is reached; this temperature can be set as desired. From the heated water vapour passes along the pipe J, and enters the thermostat chamber, passing round the

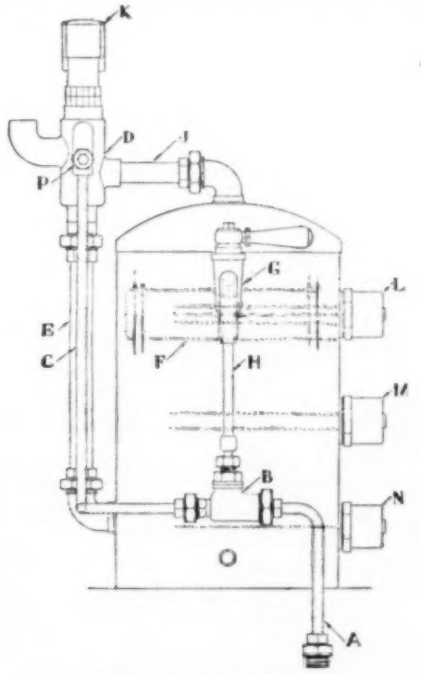


Fig. 5.—Automatic Electric Boiler.

thermostat to atmosphere at Y. This renders it impossible to get any pressure above atmosphere in the boiler. The vapour acting on the thermostat automatically cuts out of circuit the pre-determined loadings, leaving in only small loadings sufficient to maintain the temperature. The boiler is of polished hard-rolled copper, heavily tinned inside; the pipes are of solid drawn copper, and the fittings are of high-quality gunmetal.

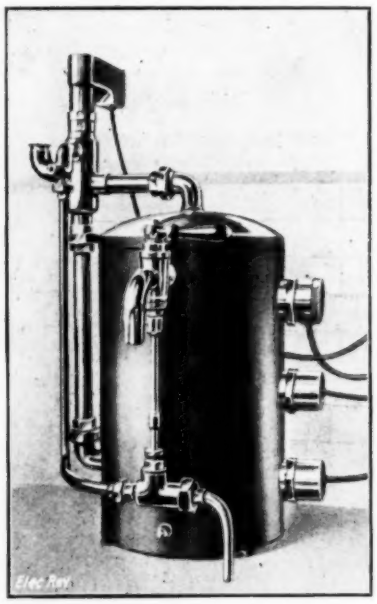


Fig. 6.—The Rothway Boiler.

The apparatus is supplied in eight load ratings from 3.7 to 10.7 kW, representing respectivly maintained deliveries of boiling water per hour of 60 and 174 pints. The overall dimensions are, height 3 ft. 5 in., width 2 ft., and length (back to front) 1 ft. 9 in.

Correspondence.

Correspondents should forward their communications* at the earliest possible moment.** ***No letter can be published unless we have the writer's name and address in our possession.

Municipal Capital Costs.

Your article by "Interested" is of great importance, and I should be very glad to know whether it is quite certain that his interpretation of the clause quoted is correct. I certainly have read quite a different meaning into it, and one which appears to me to be the literal meaning of the words. Assuming it is correct and reasonable that staff salaries should always be charged to revenue, it is quite otherwise with the employés. The question seems to be "What part of the wages is ordinarily charged to revenue?" The answer seems obviously "that part which is paid in respect of running or maintenance work." Such work, however, as adds to the assets of the undertaking is, of course, work of a capital nature, and therefore wages as well as materials should "ordinarily" be charged as capital. Certainly the question of what is or is not capital expenditure does not depend on the status of the workman (*i.e.*, permanent or temporary), but on the nature of the work itself. Assuming that every man makes out a time sheet, one would naturally suppose that so much of his time as is occupied on work of a capital nature would ordinarily be charged to the capital account concerned—to charge it to revenue would seem to me to be extraordinary.

The Commissioners apparently do not object to permanent men working some part (or even all) of their time on capital works, but the prohibition *does* seem (quite properly) against charging such "part" of the salary or wages as would "ordinarily" be charged to revenue.

Costs Count.

July 6th, 1926.

Economics and the Engineer.

In connection with Mr. Harrison Dent's interesting plea for more stress on economics in the training of engineers, it may be of interest to point out that in at least one Empire University, the University of Toronto, economics is an integral part of all engineering courses, lectures being given in the various years on exchange, company law, industrial management, and so on.

A. W. Swan,
Publicity Dept.,
EVERSHED & VIGNOLES, LTD.

London, W.4, *July 6th*, 1926.

Electric Cooking and Heating.

We have read with interest the letter from "Thermos" appearing in your issue of the 9th inst., and are writing particularly with regard to the last paragraph, in which your correspondent states that "there is probably only one firm manufacturing a radiator which makes it imperative to switch off at the plug in order to switch off the whole of the radiator."

We have been manufacturing radiators for the past seven years which have conformed to this I.E.E. recommendation, and should be glad to send "Thermos" particulars if he will communicate with us.

Imperial Engineering Co.
GEORGE W. CLOSE.

Wolverhampton, *July 12th*, 1926.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

Coal from Powdered Fuel.—On July 5th, Lord EUSTACE PERCY informed Brig.-Gen. Charteris that the utilisation of coal in the form of powdered fuel had been worked out by commercial firms, especially in America, and particulars were available from ordinary sources. No special investigations had, therefore, been carried out by the Department of Scientific and Industrial Research, but that Department had published a report on "Pulverised Coal Systems in America," the third edition of which was issued by the Stationery Office early in 1924.

Telephones.—On July 6th, Sir W. MITCHELL-THOMSON informed Sir H. Brittain that the number of telephones per 100 inhabitants in Great Britain was 3.28. The figures for other countries were: United States 14.2, Canada 11.6, Sweden 6.9, and Germany 3.9.

Unlicensed Wireless Sets.—On July 6th, Sir W. MITCHELL-THOMSON informed Sir H. Brittain that the number of wireless licences issued showed a steady increase, but it was impossible to say to what extent the increase was attributable to the practice of broadcasting notices concerning the use of unlicensed wireless sets. The number of persons prosecuted for the use of unlicensed wireless apparatus since the passage of the Wireless Telegraphy (Explanation) Act last autumn was 206. The maximum penalty imposed was £10 in addition to £10 costs.

Guildford Corporation Bill.—This Bill was considered by a Committee of the House of Lords last week, and there was no further opposition to the clause giving the Corporation power to sell fittings and carry out wiring. It was opposed in the House of Commons by local electrical contractors. (The proceedings were reported in our issue of April 30th.) The clause gives full selling and wiring powers, and also provides that if the Corporation commences proceedings for the summary recovery of a sum due for the supply of electricity, any other sum due for the sale or hire of fittings, or for materials, or for work done by the Corporation under this clause, may be included in the summons and recovered summarily, provided the latter sum does not exceed £20.

Colwyn and Colwyn Bay Bill.—The Local Legislation Committee of the House of Commons considered the fittings and wiring clause in this Bill on July 7th. There was no opposition on this occasion by the local contractors, as in the House of Lords (reported in our issues of March 26th and April 2nd), but the clause has been amended and is now in the same terms as that in the Guildford Corporation Bill. Originally the Colwyn Bay clause gave the Council power to recover summarily amounts due for the sale or hire of fittings, or for materials, or work done, up to £20, but it can only recover such sums summarily, under the amended clause, in cases where the Council is taking proceedings in respect of sums due for electricity supplied.

Mr. EDWARD WILSON (chairman of the Lighting Committee of the Council), in evidence, said that the electricity undertaking was not going ahead so fast as he would have wished. There was scope for considerable development, and one of the reasons why it had not developed was the difficulty with regard to fittings and wiring.

Mr. J. SMITH (manager of the gas and electricity undertakings) said the capital expenditure on the electricity undertaking was £102,999, and there were just over 2,000 consumers.

The CHAIRMAN (Sir Thomas Robinson) said that the Committee considered that the Council should work with the local contractors as much as possible. Mr. SMITH replied that that was the intention.

The CHAIRMAN said the Committee did not want the Council to open a department with a staff of six or seven persons. The Council would have power to step in if there were profiteering on the part of the contractors. If the clause were used discreetly and wisely it should do good. The Committee approved the clause.

The Coal Shortage.—On July 7th, Sir W. JOYNSON-HICKS, the Home Secretary, stated that the Government was not going to buy coal for the large electrical undertakings nor for the large gas undertakings. They could buy coal quite as well as the Government could. There were very large numbers of consumers for whom the Government was responsible and for whom it accepted the responsibility. There were the smaller municipalities and the smaller commercial undertakings. During the general strike the Government supplied

volunteers to no fewer than 33 power stations in London and it was enormously to the credit of the Minister of Transport and the Electricity Commissioners that the electricity supply of London was maintained.

Poplar Power Station Coal. — On July 12th, Mr. LANSBURY asked the Secretary for Mines whether he was aware that during the months of May and June the Poplar electricity station consumed 6,182 tons of coal, and that during this period the Borough Council was charged various prices for coal, these ranging from 100 per cent. above the contract prices; and whether he would cause inquiries to be made into this state of affairs and take the necessary steps to put an end to this profiteering.

Col. LANE FOX said he had been supplied with particulars of that case, and he understood that of the amount of coal consumed, 4,500 tons were taken from stock and was not affected by any rise in price. He was having the figures of the remainder analysed, but in present circumstances substantial increases were inevitable, and did not necessarily involve profiteering.

Special Orders.—Special Orders have been approved relating to Millom, Teignmouth (Extension), and South Yorkshire (Extension).

Private Bills.—The Mexborough and Swinton Tramways Bill, and the Shropshire, Worcestershire, and Staffordshire Electric Power Bill have been read a second time in the House of Commons.

Legal.

Charge Dismissed.

AT Newcastle-under-Lyne Quarter Sessions, on July 3rd, a jury returned a verdict of "not guilty" in the case of John Stanley Cook, electrical engineer, on a charge of fraudulently using Corporation electricity. The prosecution's case was that defendant had connected a lamp to a power meter. Evidence was called to prove that the lamp was used to light the defendant's shop.

The defence was that the use of the lamp for light was only incidental, and that the main purpose of the lamp was to act as a resistance when charging accumulators. Defendant's witnesses stated that in Birmingham and other places the practice was common, and that it was customary for such lamps to be used and charged for at the power rate.

Bowfa Engineering Co. v. The P.D.C. Manufacturing Co.

IN the Shoreditch County Court, on July 8th, before Judge Cluer, the Bowfa Engineering Company, Limehouse, E., manufacturers of radio sets, sued the P. & C. Manufacturing Co., City Road, E.C., manufacturers of radio accessories, to recover £50, money lent, or alternatively for the return of the £50, paid as a deposit against goods to be delivered, consisting of aluminium "low-loss" end plates. The case had been remitted from the High Court.

Mr. ALFRED GOULD, of the plaintiff firm, stated that on November 6th he offered to buy £500 worth of condenser vanes, paying cash, the order to be completed in two months, if defendants would grant a special discount of 5 per cent. On November 10th, Mr. Posner, of the defendant firm, called and said he would accept the order for £500 worth, but witness told him he was too late. Posner offered to supply end plates at 40s. per gross pairs. Witness gave an order for 100 gross, stipulating part delivery in seven days, and the balance in fourteen days. They could have done with the goods, as they were very busy up to December, but, after Christmas, trade always fell off. A late delivery in the wireless trade was useless, as an accessory was changed and improved every three months. On November 11th, Posner called and asked for £50 with which to buy some aluminium plates which were going cheap, and he let him have it. As no delivery had been made up to November 27th, he insisted on immediate delivery, but when told it could not be done, witness cancelled the order, except as to £50 worth which defendants had got the money for. They had never received any of the goods. He had stopped another £50 cheque which the defendants said they required for wages. In cross-examination, he denied that he ever placed an order for £500 worth of condenser vanes, or that when he was asked for the money he said he had been buying very heavily, but would give £50 as an earnest. As a fact, he found a day or two after that he could buy them 15 per cent. cheaper. Posner never told him that he would have to have special tools made for the plates. He could have done with them even up to February, but the pattern had now been altered, and only very small quantities were wanted.

For the defence, Mr. WILLIAM POSNER said that Mr. Gould made an offer to pay £500 down if the order carried a special discount of 5 per cent. When he asked for the £500, Mr. Gould said he had been buying heavily, but to show his good faith he would give him £50 on account, and did so. End plates were then discussed, and he offered to make them at plaintiffs' price, if a fair quantity were ordered, this being necessary because he would have to have tools specially made. He decided to put the £50 he had received against this order for plates to cover him against any possible loss in connection with the tools. The second £50 cheque was in part payment of the contract, and was not a loan at all. They were counterclaiming for £107, less £50 received, the balance being the cost of the plates and aluminium sheeting, and to cutting, labour, and loss of profit. In cross-examination, he said he considered that two months was a reasonable period for the execution of an order for wireless accessories.

Judge CLUER said the story of the defendants was obviously untrue, and the plaintiffs were entitled to cancel their contract because of the late delivery, radio orders being for early delivery. The plaintiffs would have judgment for their £50, and also on the counterclaim, both judgments being with costs.

Duram, Ltd.

A PETITION by Duram, Ltd., to confirm a reduction of its capital, came before Mr. Justice Eve in the Chancery Division on July 6th. Counsel said that it was proposed to cancel capital that had been lost or was unrepresented by available assets. It was intended to write off certain patent rights which were no longer of value.

His Lordship confirmed the reduction.

Bogota Telephone Co., Ltd.

MR. JUSTICE EVE, in the Chancery Division on July 6th, sanctioned a scheme of arrangement by which the holders of deferred shares in the Bogota Telephone Co., Ltd., will give up a portion of their shares while the remainder of them will be converted into ordinary shares. Mr. HECKSHER, for the company, said that the profits for the last year were £20,000.

Theft of Cable.

ARTHUR BRADBURY, Bolton-on-Dearne, was fined 40s. at Doncaster on July 10th for the theft of electric copper cable from Callender's Cable & Construction Co., Ltd. He was seen to go into a field and wind wire from a drum around his body. A file was found on him which had been used for cutting the wire.

St. James' and Pall Mall Electric Light Co., Ltd.

IN the Chancery Division, on July 6th, Mr. Justice Eve confirmed an alteration of the objects of this company so as to enable it to establish a pension fund for its employés.

British Thomson-Houston Co., Ltd., v. Letton & Co., Ltd.

BEFORE Mr. Justice Meredith, in the High Courts, Dublin, recently, the plaintiffs sought to obtain a permanent injunction to restrain infringement of a patent of theirs by the defendant company dealing in electric lamps made in France. Mr. Marnan, for the plaintiff company, said that patent had been granted to them and their claims to it enforced by a judgment of the House of Lords. His LORDSHIP said he wanted to see the grant in order to ascertain over what area the patent rights extended, the defence put in by Mr. Gavan Duffy being that the grant was under the English Patents Act and did not extend to the Irish Free State.

Damage to Electric Cables in Dock.

ON July 8th the Court of Appeal, consisting of Lords Justices Bankes, Atkin, and Sargant (sitting with Nautical Assessors), concluded the hearing of an appeal by the Great Western Railway Company from the judgment of the President of the Admiralty Division dismissing the action which the Railway Company, as the owners of the Swansea Docks, brought against the owners of the steamship *Mostyn* to recover the cost of repairing three electric cables laid on the floor of the passage way between the King's and Prince of Wales's Docks, which, on the night of October 26th, 1923, were damaged by the anchor of the *Mostyn* whilst that vessel was entering the Prince of Wales's Dock. As a result of the accident the docks were plunged into darkness.

The defendants denied negligence and liability, and pleaded that the accident was inevitable, and, further, that the Railway Company, as the dock authority, had been guilty of contributory negligence as there had been no warning given to the pilot of the *Mostyn* of the presence of the cables.

The President had held that the defendants had not been guilty of negligence, and that so far as they were concerned the accident was unavoidable. He accordingly dismissed the action with costs.

At the conclusion of the argument their Lordships dismissed the appeal with costs, holding that there was no negligence on the part of the defendants, and having regard to a decision of the House of Lords in a previous case the defendants could not be made liable under the provisions of the Harbours, Docks and Piers Clauses Act, 1847.

Electric Iron Smelting. — According to Norwegian messages the Graengesberg Company is planning the purchase of the right of exploitation in Sweden of the electric iron-melting method invented by the Norwegian engineer, M. Edwin, and owned by Aktieselskapet Norsk Staal.—*Reuter's Trade Service* (Stockholm).

Trade-Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from July 7th :—

Dupelco Amplifier, Auxiliary Psychic Sounds (lettering and design). No. 467,191. Class 8. Apparatus containing a diaphgram or microphone for use in psychic research to amplify sound.—T. Blyton, Psychecote, Battle, Sussex, and H. D. Bradley, Kingston Vale, S.W.15.

Trigranic. No. 470,043. Class 8. Instruments and apparatus for use in connection with wireless telegraphy and telephony.—Igranic Electric Co., Ltd.

Wefco. No. 467,238. Electric lamps and torches, electrical fittings, lamp casings, &c.—Watts, Fincham & Co., Ltd., 22, Billiter Street, E.C.3.

Published Specifications.

Compiled expressly for this journal by Patent Agents

The name of the applicant's patent agent, if any, will be found on the printed specification.

The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1924.

1,640. "Holders for movable inductance coils." Igranic Electric Co., Ltd. A. H. Curtis and G. Holdway. October 19th, 1925. (253,564.)

6,740. "Automatic or semi-automatic telephone systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.) and L. P. Lowry. March 12th, 1925. (253,574.)

6,741. "Automatic or semi-automatic telephone systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.), and L. P. Lowry. March 12th, 1925. (253,575.)

6,746. "Automatic circuit-breakers." Igranic Electric Co., Ltd., and A. H. Curtis. March 12th, 1925. (253,576.)

6,760. "Locking devices for electric incandescent lamps." E. C. Given. March 12th, 1925. (253,195.)

6,867. "Telephone systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.). (G. Deakin). March 13th, 1925. (253,578.)

7,082. "Automatic telephone systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.), R. A. Moir, and G. C. Hartley. March 16th, 1925. (253,583.)

7,115. "Polyphase communication machines." A. H. Heyland. May 12th, 1924. (233,667.)

7,119. "Automatic or semi-automatic telephone systems." Automatic Telephone Manufacturing Co., Ltd. June 9th, 1924. (235,142.)

7,218. "Combined cabinets and acoustic amplifiers or sound radiators, suitable for use with wireless receiving apparatus." E. A. Graham. March 17th, 1925. (253,593.)

7,254. "Telephone systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.), and G. C. Hartley. March 17th, 1925. (253,595.)

7,256. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. May 19th, 1924. (234,659.)

7,325. "Systems of control for electric motors." British Thomson-Houston Co., Ltd., and H. C. Hastings. March 18th, 1925. (253,598.)

7,448. "Electric relays." A. Reyrolle & Co., Ltd., and B. H. Leeson. March 19th, 1925. (253,605.)

7,539. "Coarse- and fine-adjustment devices for electrical instruments of precision." India Rubber Gutta Percha & Telegraph Works Co., Ltd., W. G. Spinks, and T. J. Keeley. March 20th, 1925. (Cognate application, 9,433/25.) (253,612.)

7,623. "Operating-gear of electric switches." A. Reyrolle & Co., Ltd., A. Allan, and H. W. Clothier. March 20th, 1925. (253,617.)

7,634. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., and J. E. Outline. March 20th, 1925. (Patent of addition not granted.) (253,619.)

7,819. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. (Automatic Electric Co.). March 23rd, 1925. (253,625.)

8,051. "Artificial lines and electric wave filters." General Electric Co., Ltd., and A. C. Bartlett. March 25th, 1925. (253,629.)

8,133. "Automatic and semi-automatic telephone systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.), A. M. Searle, R. A. Moir, and J. H. E. Baker. March 26th, 1925. (253,631.)

8,143. "Adjustable coil-holders for use in wireless apparatus." C. G. Hofman. March 26th, 1925. (253,632.)

8,238. "Thermally-operated electric switches." Siemens Bros. & Co., Ltd., E. A. Petithory, and S. R. Garrod. March 27th, 1925. (253,634.)

8,280. "Lamp casings." British Thomson-Houston Co., Ltd., A. P. Young, and H. W. H. Warren. March 27th, 1925. (253,637.)

8,456. "Automatic and semi-automatic telephone systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.), R. A. Moir, G. C. Hartley, and A. J. Chanter. March 30th, 1925. (253,640.)

8,817. "Protective device or arrangement for the circuits of electric train lighting and similar installations." J. Stone & Co., Ltd., and A. E. Honey. April 2nd, 1925. (253,645.)

8,847. "Automatic and semi-automatic telephone systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.), and J. H. E. Baker. April 2nd, 1925. (253,646.)

8,985. "Variable electric resistances." British Thomson-Houston Co., Ltd., P. T. Harris, and A. T. Stace. April 3rd, 1925. (253,648.)

9,304. "Dynamo-electric machinery." J. W. Burleigh. April 8th, 1925. (253,650.)

9,724. "Flywheel magnetos for automobile vehicles and the like." Soc. D'Applications et de Fabrications Industrielles Safi. August 14th, 1924. (238,508.)

10,633. "Fittings for the suspension or support of electric lamps." Wardle Engineering Co., Ltd., and E. E. Hopwood. April 24th, 1925. (253,663.)

11,050. "Distant-control device for use over telephone lines." Soc. Française Radio-Electrique. April 28th, 1924. (232,936.)

11,223. "Electroplating with cadmium." Udylite Process Co. June 5th, 1924. (235,159.)

11,360. "Method of and means for mounting filaments in thermionic valves and the like." W. R. Bullimore. May 1st, 1925. (253,668.)

11,481. "Insulation and securing of parts of electrical apparatus, more particularly applicable to electric kettles and like vessels." G. H. Collins and H. F. Collins. May 4th, 1925. (253,670.)

11,775. "Circuit arrangements for selectors in telephone systems." Siemens Bros. & Co., Ltd., and H. E. Humphries. May 6th, 1925. (253,673.)

11,995. "Adjustable holders for inductance and like coils." H. G. Moore. May 8th, 1925. (253,677.)

12,098. "Electromagnetic circuit-breakers." A. H. Railing and A. E. Angold. May 9th, 1925. (253,679.)

12,234. "Telephone instruments." Neufeldt & Kuhnke. May 12th, 1924. (233,733.)

12,477. "Electrical control systems." Metropolitan-Vickers Electrical Co., Ltd. May 15th, 1924. (234,111.)

12,556. "Telephone receivers, sound-reproducers, and like instruments." P. J. Mullaly and M. V. Pirie. May 14th, 1925. (253,687.)

12,575. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., and F. P. Whitaker. May 14th, 1925. (253,688.)

12,833. "Electric cables." St. Helens Cable & Rubber Co., Ltd., and H. Harrison. May 16th, 1925. (253,691.)

12,991. "Telephone receivers." J. W. Dungey. May 18th, 1925. (253,695.)

13,148. "Signalling (ringing) arrangements for carrier wave systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.) (Western Electric Co., Inc.). May 20th, 1925. (253,697.)

13,888. "Repeater gain-control systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.), (Western Electric Co., Inc.). May 27th, 1925. (253,703.)

14,415. "Telephone instruments." Automatic Telephone Manufacturing Co., Ltd. (Automatic Electric Co.). June 2nd, 1925. (253,709.)

14,668. "Governing-system." Metropolitan-Vickers Electrical Co., Ltd. June 9th, 1924. (235,216.)

15,014. "Supports for electric secondary batteries." Hart Accumulator Co., Ltd., and F. J. Holmes. June 9th, 1925. (253,713.)

15,419. "Synchronous motors." R. Michl. June 13th, 1924. (Addition to 191,313.) (235,399.)

15,691. "Magnetic circuit of telephone receivers." Compagnie pour la Fabrication des Compteurs et Materiel D'Usines a Gaz. July 8th, 1924. (236,912.)

17,151. "Means for generating electrical oscillations." Telefunken Ges. fur Drahtlose Telegraphie. July 25th, 1924. (237,585.)

18,546. "Electric lamp holders and the like." R. T. Waite. July 21st, 1925. (253,735.)

20,159. "Cartridge-type wireless detector." W. Bennison and L. V. Clark. August 11th, 1925. (253,746.)

23,015. Commutator motors or generators with switching arrangements for the rotor winding." C. Lott. November 7th, 1924. (242,602.)

23,568. "Electrical circuit arrangements, particularly applicable to telephone systems." Automatic Telephone Manufacturing Co., Ltd. (Automatic Electric Co.). March 17th, 1925. (Divided application on 234,659.) (253,761.)

23,758. "Apparatus for the testing of sparking plugs, magnetos, and the like." F. P. E. Rickard, P. E. Rickard, and J. Hetherington. September 23rd, 1925. (253,762.)

23,899. "Expansion chambers for oil-cooled electric transformers." British Electric Transformer Co., Ltd., and D. P. Flockart. September 24th, 1925. (253,764.)

24,604. "Coil-holder and coil for wireless apparatus." A. C. V. Hansen. July 16th, 1925. (253,767.)

24,823. "Mechanical and electromechanical wave-filtering systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.). November 24th, 1924. (243,321.)

26,334. "High-tension electrostatic condenser." Etablissements Merlin and Gerin. October 25th, 1924. (241,911.)

26,636. "Sparking plugs." N. M. Martin. October 23rd, 1925. (253,780.)

26,821. "Conduits or underground passages for gas-mains, electric conductors, and the like." Luzeroy, Ltd., and A. Rogers-Jenkins. October 26th, 1925. (253,782.)

28,493. "Electric protective arrangements for consumers' current-distributive systems." Rheinisch-Westfalisches Elektricitatswerke Akt.-Ges. November 29th, 1924. (243,703.)

28,494. "Electric protective arrangements for consumers' current distributive systems." Rheinisch-Westfalisches Elektricitatswerke Akt.-Ges. December 23rd, 1924. (Addition to 243,703.) (245,077.)

28,883. "Electrolytic meters." Chamberlain & Hookham, Ltd. November 14th, 1924. (243,024.)

29,234. "Electric couplings or connectors." S. D. White and F. D. Berners. November 19th, 1925. (253,796.)

29,246. "Wireless receivers of the heterodyne type." Marconi's Wireless Telegraph Co., Ltd. November 20th, 1924. (243,371.)

29,927. "Magneto-electric generators." X. Bullinger. November 27th, 1924. (243,746.)

30,568. "Electric heaters of the reflector type." J. Schoenfeld. December 3rd, 1925. (253,805.)

30,957. "Electric lamp holders." E. Reich. December 8th, 1925. (253,809.)

31,361. "Thermo-electric batteries." G. Duch. December 27th, 1924. (245,093.)

31,771. "Thermostats." L. Legendre. December 19th, 1924. (244,783.)

32,906. "Automatic regulating arrangements for electric supply systems." British Thomson-Houston Co., Ltd. January 17th, 1925. (246,121.)

1926.

703. "High-frequency electric signalling and remote-control systems." British Thomson-Houston Co., Ltd. January 10th, 1925. (245,795.)

2,902. "Electric incandescent lamps." B. Claus. February 2nd, 1926. (253,826.)

4,264. "Electric discharge devices." Raytheon Manufacturing Co. March 5th, 1925. (248,722.)

6,791. "Lamp shades." G. W. Edwards and P. J. Oldfield. March 11th, 1926. (253,839.)

7,185. "Indicating devices." Metropolitan-Vickers Electrical Co., Ltd. April 15th, 1925. (250,914.)

8,667. "Plug couplings for electric controlling apparatus." Sullivan Machinery Co. October 31st, 1924. (Divided Application on 242,220.) (250,289.)

9,596. "Manufacture of incandescent electric lamps." Westinghouse Lamp Co. April 23rd, 1925. (251,259.)

11,440. "Light-measuring instruments." British Thomson-Houston Co., Ltd. April 30th, 1925. (251,654.)

12,724. "Automatic and semi-automatic telephone systems." Siemens Bros. and Co., Ltd., and H. E. Humphries. February 14th, 1925. (Divided Application on 252,244.) (253,851.)

How Electricity Supply was maintained during the Strike.—With reference to the note under the above heading in our issue of June 4th (page 839) with respect to the manual workers employed at Rotherham, we are informed by Mr. E. Hutchinson, district agent (Sheffield), of the National Winding and General Engineers' Society, "that every employé at Rotherham, with the exception of those that are members of the E.P.E.A., is directly connected with the T.U.C., through his federation, and was instructed to remain at work in accordance with instructions received from that body, to create power for utility services, such instructions being loyally adhered to."